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A2 ALTITUDE CORRECTION TABLES 10°-90°—SUN, STARS, PLANETS

SUN

OCT.—MAR. App. Alt.	Lower Limb	Upper Limb	APR.—SEPT. App. Alt.	Lower Limb	Upper Limb
° ′	′	′	° ′	′	′
9 34	+10·8	−21·5	9 39	+10·6	−21·2
9 45	+10·9	−21·4	9 51	+10·7	−21·1
9 56	+11·0	−21·3	10 03	+10·8	−21·0
10 08	+11·1	−21·2	10 15	+10·9	−20·9
10 21	+11·2	−21·1	10 27	+11·0	−20·8
10 34	+11·3	−21·0	10 40	+11·1	−20·7
10 47	+11·4	−20·9	10 54	+11·2	−20·6
11 01	+11·5	−20·8	11 08	+11·3	−20·5
11 15	+11·6	−20·7	11 23	+11·4	−20·4
11 30	+11·7	−20·6	11 38	+11·5	−20·3
11 46	+11·8	−20·5	11 54	+11·6	−20·2
12 02	+11·9	−20·4	12 10	+11·7	−20·1
12 19	+12·0	−20·3	12 28	+11·8	−20·0
12 37	+12·1	−20·2	12 46	+11·9	−19·9
12 55	+12·2	−20·1	13 05	+12·0	−19·8
13 14	+12·3	−20·0	13 24	+12·1	−19·7
13 35	+12·4	−19·9	13 45	+12·2	−19·6
13 56	+12·5	−19·8	14 07	+12·3	−19·5
14 18	+12·6	−19·7	14 30	+12·4	−19·4
14 42	+12·7	−19·6	14 54	+12·5	−19·3
15 06	+12·8	−19·5	15 19	+12·6	−19·2
15 32	+12·9	−19·4	15 46	+12·7	−19·1
15 59	+13·0	−19·3	16 14	+12·8	−19·0
16 28	+13·1	−19·2	16 44	+12·9	−18·9
16 59	+13·2	−19·1	17 15	+13·0	−18·8
17 32	+13·3	−19·0	17 48	+13·1	−18·7
18 06	+13·4	−18·9	18 24	+13·2	−18·6
18 42	+13·5	−18·8	19 01	+13·3	−18·5
19 21	+13·6	−18·7	19 42	+13·4	−18·4
20 03	+13·7	−18·6	20 25	+13·5	−18·3
20 48	+13·8	−18·5	21 11	+13·6	−18·2
21 35	+13·9	−18·4	22 00	+13·7	−18·1
22 26	+14·0	−18·3	22 54	+13·8	−18·0
23 22	+14·1	−18·2	23 51	+13·9	−17·9
24 21	+14·2	−18·1	24 53	+14·0	−17·8
25 26	+14·3	−18·0	26 00	+14·1	−17·7
26 36	+14·4	−17·9	27 13	+14·2	−17·6
27 52	+14·5	−17·8	28 33	+14·3	−17·5
29 15	+14·6	−17·7	30 00	+14·4	−17·4
30 46	+14·7	−17·6	31 35	+14·5	−17·3
32 26	+14·8	−17·5	33 20	+14·6	−17·2
34 17	+14·9	−17·4	35 17	+14·7	−17·1
36 20	+15·0	−17·3	37 26	+14·8	−17·0
38 36	+15·1	−17·2	39 50	+14·9	−16·9
41 08	+15·2	−17·1	42 31	+15·0	−16·8
43 59	+15·3	−17·0	45 31	+15·1	−16·7
47 10	+15·4	−16·9	48 55	+15·2	−16·6
50 46	+15·5	−16·8	52 44	+15·3	−16·5
54 49	+15·6	−16·7	57 02	+15·4	−16·4
59 23	+15·7	−16·6	61 51	+15·5	−16·3
64 30	+15·8	−16·5	67 17	+15·6	−16·2
70 12	+15·9	−16·4	73 16	+15·7	−16·1
76 26	+16·0	−16·3	79 43	+15·8	−16·0
83 05	+16·1	−16·2	86 32	+15·9	−15·9
90 00			90 00		

STARS AND PLANETS

App. Alt.	Corrn
° ′	′
9 56	−5·3
10 08	−5·2
10 20	−5·1
10 33	−5·0
10 46	−4·9
11 00	−4·8
11 14	−4·7
11 29	−4·6
11 45	−4·5
12 01	−4·4
12 18	−4·3
12 35	−4·2
12 54	−4·1
13 13	−4·0
13 33	−3·9
13 54	−3·8
14 16	−3·7
14 40	−3·6
15 04	−3·5
15 30	−3·4
15 57	−3·3
16 26	−3·2
16 56	−3·1
17 28	−3·0
18 02	−2·9
18 38	−2·8
19 17	−2·7
19 58	−2·6
20 42	−2·5
21 28	−2·4
22 19	−2·3
23 13	−2·2
24 11	−2·1
25 14	−2·0
26 22	−1·9
27 36	−1·8
28 56	−1·7
30 24	−1·6
32 00	−1·5
33 45	−1·4
35 40	−1·3
37 48	−1·2
40 08	−1·1
42 44	−1·0
45 36	−0·9
48 47	−0·8
52 18	−0·7
56 11	−0·6
60 28	−0·5
65 08	−0·4
70 11	−0·3
75 34	−0·2
81 13	−0·1
87 03	0·0
90 00	

App. Alt. Additional Corrn

1977

VENUS

Jan. 1-Jan. 29
0°
47 + 0′·2

Jan. 30-Feb. 26
0°
46 + 0′·3

Feb. 27-Mar. 14
0°
11 + 0′·4
41 + 0·5

Mar. 15-Mar. 23
0°
6 + 0′·5
20 + 0·6
31 + 0·7

Mar. 24-Apr. 19
0°
4 + 0′·6
12 + 0·7
22 + 0·8

Apr. 20-Apr. 28
0°
6 + 0′·5
20 + 0·6
31 + 0·7

Apr. 29-May 13
0°
11 + 0′·4
41 + 0·5

May 14-June 8
0°
46 + 0′·3

June 9-July 23
0°
47 + 0′·2

July 24-Dec. 31
0°
42 + 0′·1

MARS

Jan. 1-Nov. 12
0°
60 + 0′·1

Nov. 13-Dec. 31
0°
41 + 0′·2
75 + 0·1

DIP

Ht. of Eye	Corrn	Ht. of Eye
m	′	ft.
2·4	−2·8	8·0
2·6	−2·9	8·6
2·8	−3·0	9·2
3·0	−3·1	9·8
3·2	−3·2	10·5
3·4	−3·3	11·2
3·6	−3·4	11·9
3·8	−3·5	12·6
4·0	−3·6	13·3
4·3	−3·7	14·1
4·5	−3·8	14·9
4·7	−3·9	15·7
5·0	−4·0	16·5
5·2	−4·1	17·4
5·5	−4·2	18·3
5·8	−4·3	19·1
6·1	−4·4	20·1
6·3	−4·5	21·0
6·6	−4·6	22·0
6·9	−4·7	22·9
7·2	−4·8	23·9
7·5	−4·9	24·9
7·9	−5·0	26·0
8·2	−5·1	27·1
8·5	−5·2	28·1
8·8	−5·3	29·2
9·2	−5·4	30·4
9·5	−5·5	31·5
9·9	−5·6	32·7
10·3	−5·7	33·9
10·6	−5·8	35·1
11·0	−5·9	36·3
11·4	−6·0	37·6
11·8	−6·1	38·9
12·2	−6·2	40·1
12·6	−6·3	41·5
13·0	−6·4	42·8
13·4	−6·5	44·2
13·8	−6·6	45·5
14·2	−6·7	46·9
14·7	−6·8	48·4
15·1	−6·9	49·8
15·5	−7·0	51·3
16·0	−7·1	52·8
16·5	−7·2	54·3
16·9	−7·3	55·8
17·4	−7·4	57·4
17·9	−7·5	58·9
18·4	−7·6	60·5
18·8	−7·7	62·1
19·3	−7·8	63·8
19·8	−7·9	65·4
20·4	−8·0	67·1
20·9	−8·1	68·8
21·4		70·5

Ht. of Eye Corrn

m ′
1·0 — 1·8
1·5 — 2·2
2·0 — 2·5
2·5 — 2·8
3·0 — 3·0
See table
←

m ′
20 — 7·9
22 — 8·3
24 — 8·6
26 — 9·0
28 — 9·3

30 — 9·6
32 — 10·0
34 — 10·3
36 — 10·6
38 — 10·8

40 — 11·1
42 — 11·4
44 — 11·7
46 — 11·9
48 — 12·2

ft. ′
2 — 1·4
4 — 1·9
6 — 2·4
8 — 2·7
10 — 3·1
See table
←

ft.
70 — 8·1
75 — 8·4
80 — 8·7
85 — 8·9
90 — 9·2
95 — 9·5

100 — 9·7
105 — 9·9
110 — 10·2
115 — 10·4
120 — 10·6
125 — 10·8

130 — 11·1
135 — 11·3
140 — 11·5
145 — 11·7
150 — 11·9
155 — 12·1

App. Alt. = Apparent altitude = Sextant altitude corrected for index error and dip.
For daylight observations of Venus, see page 260.

ALTITUDE CORRECTION TABLES 0°–10°—SUN, STARS, PLANETS

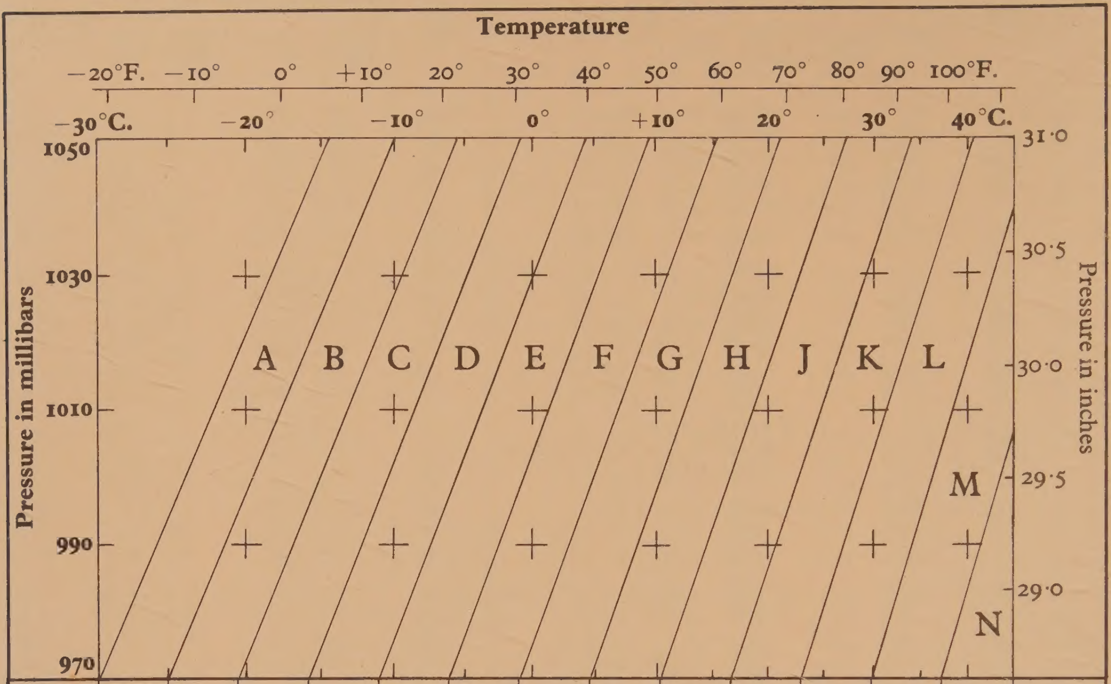
App. Alt.	OCT.–MAR. SUN Lower Limb	Upper Limb	APR.–SEPT. Lower Limb	Upper Limb	STARS PLANETS
° ′	′	′	′	′	′
0 00	−18·2	−50·5	−18·4	−50·2	−34·5
03	17·5	49·8	17·8	49·6	33·8
06	16·9	49·2	17·1	48·9	33·2
09	16·3	48·6	16·5	48·3	32·6
12	15·7	48·0	15·9	47·7	32·0
15	15·1	47·4	15·3	47·1	31·4
0 18	−14·5	−46·8	−14·8	−46·6	−30·8
21	14·0	46·3	14·2	46·0	30·3
24	13·5	45·8	13·7	45·5	29·8
27	12·9	45·2	13·2	45·0	29·2
30	12·4	44·7	12·7	44·5	28·7
33	11·9	44·2	12·2	44·0	28·2
0 36	−11·5	−43·8	−11·7	−43·5	−27·8
39	11·0	43·3	11·2	43·0	27·3
42	10·5	42·8	10·8	42·6	26·8
45	10·1	42·4	10·3	42·1	26·4
48	9·6	41·9	9·9	41·7	25·9
51	9·2	41·5	9·5	41·3	25·5
0 54	− 8·8	−41·1	− 9·1	−40·9	−25·1
0 57	8·4	40·7	8·7	40·5	24·7
1 00	8·0	40·3	8·3	40·1	24·3
03	7·7	40·0	7·9	39·7	24·0
06	7·3	39·6	7·5	39·3	23·6
09	6·9	39·2	7·2	39·0	23·2
1 12	− 6·6	−38·9	− 6·8	−38·6	−22·9
15	6·2	38·5	6·5	38·3	22·5
18	5·9	38·2	6·2	38·0	22·2
21	5·6	37·9	5·8	37·6	21·9
24	5·3	37·6	5·5	37·3	21·6
27	4·9	37·2	5·2	37·0	21·2
1 30	− 4·6	−36·9	− 4·9	−36·7	−20·9
35	4·2	36·5	4·4	36·2	20·5
40	3·7	36·0	4·0	35·8	20·0
45	3·2	35·5	3·5	35·3	19·5
50	2·8	35·1	3·1	34·9	19·1
1 55	2·4	34·7	2·6	34·4	18·7
2 00	− 2·0	−34·3	− 2·2	−34·0	−18·3
05	1·6	33·9	1·8	33·6	17·9
10	1·2	33·5	1·5	33·3	17·5
15	0·9	33·2	1·1	32·9	17·2
20	0·5	32·8	0·8	32·6	16·8
25	− 0·2	32·5	0·4	32·2	16·5
2 30	+ 0·2	−32·1	− 0·1	−31·9	−16·1
35	0·5	31·8	+ 0·2	31·6	15·8
40	0·8	31·5	0·5	31·3	15·5
45	1·1	31·2	0·8	31·0	15·2
50	1·4	30·9	1·1	30·7	14·9
2 55	1·6	30·7	1·4	30·4	14·7
3 00	+ 1·9	−30·4	+ 1·7	−30·1	−14·4
05	2·2	30·1	1·9	29·9	14·1
10	2·4	29·9	2·1	29·7	13·9
15	2·6	29·7	2·4	29·4	13·7
20	2·9	29·4	2·6	29·2	13·4
25	3·1	29·2	2·9	28·9	13·2
3 30	+ 3·3	−29·0	+ 3·1	−28·7	−13·0

App. Alt.	OCT.–MAR. SUN Lower Limb	Upper Limb	APR.–SEPT. Lower Limb	Upper Limb	STARS PLANETS
° ′	′	′	′	′	′
3 30	+ 3·3	−29·0	+ 3·1	−28·7	−13·0
35	3·6	28·7	3·3	28·5	12·7
40	3·8	28·5	3·5	28·3	12·5
45	4·0	28·3	3·7	28·1	12·3
50	4·2	28·1	3·9	27·9	12·1
3 55	4·4	27·9	4·1	27·7	11·9
4 00	+ 4·5	−27·8	+ 4·3	−27·5	−11·8
05	4·7	27·6	4·5	27·3	11·6
10	4·9	27·4	4·6	27·2	11·4
15	5·1	27·2	4·8	27·0	11·2
20	5·2	27·1	5·0	26·8	11·1
25	5·4	26·9	5·1	26·7	10·9
4 30	+ 5·6	−26·7	+ 5·3	−26·5	−10·7
35	5·7	26·6	5·5	26·3	10·6
40	5·9	26·4	5·6	26·2	10·4
45	6·0	26·3	5·8	26·0	10·3
50	6·2	26·1	5·9	25·9	10·1
4 55	6·3	26·0	6·0	25·8	10·0
5 00	+ 6·4	−25·9	+ 6·2	−25·6	− 9·9
05	6·6	25·7	6·3	25·5	9·7
10	6·7	25·6	6·4	25·4	9·6
15	6·8	25·5	6·6	25·2	9·5
20	6·9	25·4	6·7	25·1	9·4
25	7·1	25·2	6·8	25·0	9·2
5 30	+ 7·2	−25·1	+ 6·9	−24·9	− 9·1
35	7·3	25·0	7·0	24·8	9·0
40	7·4	24·9	7·2	24·6	8·9
45	7·5	24·8	7·3	24·5	8·8
50	7·6	24·7	7·4	24·4	8·7
5 55	7·7	24·6	7·5	24·3	8·6
6 00	+ 7·8	−24·5	+ 7·6	−24·2	− 8·5
10	8·0	24·3	7·8	24·0	8·3
20	8·2	24·1	8·0	23·8	8·1
30	8·4	23·9	8·1	23·7	7·9
40	8·6	23·7	8·3	23·5	7·7
6 50	8·7	23·6	8·5	23·3	7·6
7 00	+ 8·9	−23·4	+ 8·6	−23·2	− 7·4
10	9·1	23·2	8·8	23·0	7·2
20	9·2	23·1	9·0	22·8	7·1
30	9·3	23·0	9·1	22·7	7·0
40	9·5	22·8	9·2	22·6	6·8
7 50	9·6	22·7	9·4	22·4	6·7
8 00	+ 9·7	−22·6	+ 9·5	−22·3	− 6·6
10	9·9	22·4	9·6	22·2	6·4
20	10·0	22·3	9·7	22·1	6·3
30	10·1	22·2	9·8	22·0	6·2
40	10·2	22·1	10·0	21·8	6·1
8 50	10·3	22·0	10·1	21·7	6·0
9 00	+10·4	−21·9	+10·2	−21·6	− 5·9
10	10·5	21·8	10·3	21·5	5·8
20	10·6	21·7	10·4	21·4	5·7
30	10·7	21·6	10·5	21·3	5·6
40	10·8	21·5	10·6	21·2	5·5
9 50	10·9	21·4	10·6	21·2	5·4
10 00	+11·0	−21·3	+10·7	−21·1	− 5·3

Additional corrections for temperature and pressure are given on the following page.

For bubble sextant observations ignore dip and use the star corrections for Sun, planets, and stars.

ADDITIONAL REFRACTION CORRECTIONS FOR NON-STANDARD CONDITIONS



App. Alt.	A	B	C	D	E	F	G	H	J	K	L	M	N	App. Alt.
° ′	′	′	′	′	′	′	′	′	′	′	′	′	′	° ′
0 00	−6·9	−5·7	−4·6	−3·4	−2·3	−1·1	0·0	+1·1	+2·3	+3·4	+4·6	+5·7	+6·9	0 00
0 30	5·2	4·4	3·5	2·6	1·7	0·9	0·0	0·9	1·7	2·6	3·5	4·4	5·2	0 30
1 00	4·3	3·5	2·8	2·1	1·4	0·7	0·0	0·7	1·4	2·1	2·8	3·5	4·3	1 00
1 30	3·5	2·9	2·4	1·8	1·2	0·6	0·0	0·6	1·2	1·8	2·4	2·9	3·5	1 30
2 00	3·0	2·5	2·0	1·5	1·0	0·5	0·0	0·5	1·0	1·5	2·0	2·5	3·0	2 00
2 30	−2·5	−2·1	−1·6	−1·2	−0·8	−0·4	0·0	+0·4	+0·8	+1·2	+1·6	+2·1	+2·5	2 30
3 00	2·2	1·8	1·5	1·1	0·7	0·4	0·0	0·4	0·7	1·1	1·5	1·8	2·2	3 00
3 30	2·0	1·6	1·3	1·0	0·7	0·3	0·0	0·3	0·7	1·0	1·3	1·6	2·0	3 30
4 00	1·8	1·5	1·2	0·9	0·6	0·3	0·0	0·3	0·6	0·9	1·2	1·5	1·8	4 00
4 30	1·6	1·4	1·1	0·8	0·5	0·3	0·0	0·3	0·5	0·8	1·1	1·4	1·6	4 30
5 00	−1·5	−1·3	−1·0	−0·8	−0·5	−0·2	0·0	+0·2	+0·5	+0·8	+1·0	+1·3	+1·5	5 00
6	1·3	1·1	0·9	0·6	0·4	0·2	0·0	0·2	0·4	0·6	0·9	1·1	1·3	6
7	1·1	0·9	0·7	0·6	0·4	0·2	0·0	0·2	0·4	0·6	0·7	0·9	1·1	7
8	1·0	0·8	0·7	0·5	0·3	0·2	0·0	0·2	0·3	0·5	0·7	0·8	1·0	8
9	0·9	0·7	0·6	0·4	0·3	0·1	0·0	0·1	0·3	0·4	0·6	0·7	0·9	9
10 00	−0·8	−0·7	−0·5	−0·4	−0·3	−0·1	0·0	+0·1	+0·3	+0·4	+0·5	+0·7	+0·8	10 00
12	0·7	0·6	0·5	0·3	0·2	0·1	0·0	0·1	0·2	0·3	0·5	0·6	0·7	12
14	0·6	0·5	0·4	0·3	0·2	0·1	0·0	0·1	0·2	0·3	0·4	0·5	0·6	14
16	0·5	0·4	0·3	0·3	0·2	0·1	0·0	0·1	0·2	0·3	0·3	0·4	0·5	16
18	0·4	0·4	0·3	0·2	0·2	0·1	0·0	0·1	0·2	0·2	0·3	0·4	0·4	18
20 00	−0·4	−0·3	−0·3	−0·2	−0·1	−0·1	0·0	+0·1	+0·1	+0·2	+0·3	+0·3	+0·4	20 00
25	0·3	0·3	0·2	0·2	0·1	−0·1	0·0	+0·1	0·1	0·2	0·2	0·3	0·3	25
30	0·3	0·2	0·2	0·1	0·1	0·0	0·0	0·0	0·1	0·1	0·2	0·2	0·3	30
35	0·2	0·2	0·1	0·1	0·1	0·0	0·0	0·0	0·1	0·1	0·1	0·2	0·2	35
40	0·2	0·1	0·1	0·1	−0·1	0·0	0·0	0·0	+0·1	0·1	0·1	0·1	0·2	40
50 00	−0·1	−0·1	−0·1	−0·1	0·0	0·0	0·0	0·0	0·0	+0·1	+0·1	+0·1	+0·1	50 00

The graph is entered with arguments temperature and pressure to find a zone letter; using as arguments this zone letter and apparent altitude (sextant altitude corrected for dip), a correction is taken from the table. This correction is to be applied to the sextant altitude in addition to the corrections for standard conditions (for the Sun, stars and planets from page A2 and for the Moon from pages xxxiv and xxxv).

THE

NAUTICAL ALMANAC

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1977
4391

FOR THE YEAR
1977

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PREFACE

The British and American editions of *The Nautical Almanac*, which are identical in content, are produced jointly by H. M. Nautical Almanac Office, Royal Greenwich Observatory, under the supervision of the Superintendent, and by the Nautical Almanac Office, United States Naval Observatory, under the supervision of R. L. Duncombe and P. M. Janiczek, to the general requirements of the Royal Navy and of the United States Navy. The Almanac is printed separately in the United Kingdom and in the United States of America.

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ALAN HUNTER,
Director,
Royal Greenwich Observatory,
Herstmonceux Castle, Sussex,
BN27 1RP, England

S. J. SLEEPER,
Captain, U.S. Navy,
Superintendent, U.S. Naval Observatory,
Washington, D.C. 20390,
U.S.A.

April 1975

RELIGIOUS CALENDARS

Epiphany	Jan. 6	Low Sunday	Apr. 17
Septuagesima Sunday	Feb. 6	Rogation Sunday	May 15
Quinquagesima Sunday	Feb. 20	Ascension Day—Holy Thursday	May 19
Ash Wednesday	Feb. 23	Whit Sunday—Pentecost	May 29
Quadragesima Sunday	Feb. 27	Trinity Sunday	June 5
Palm Sunday	Apr. 3	Corpus Christi	June 9
Good Friday	Apr. 8	First Sunday in Advent	Nov. 27
Easter Day	Apr. 10	Christmas Day	Dec. 25

Passover, First day of (Pesach)	Apr. 3	Day of Atonement (Yom Kippur)	Sept. 22
Feast of Weeks (Shebuoth)	May 23	Tabernacles, First day of (Succoth)	Sept. 27
Jewish New Year 5738 (Rosh Hashanah)	Sept. 13		

Mohammedan New Year (1398)	Dec. 12	Ramadân, First day of (tabular)	Aug. 16

CIVIL CALENDAR—BRITISH COMMONWEALTH

Australia Day	Jan. 26	St. George (England)	Apr. 23
Republic Day (India)	Jan. 26	Commonwealth Day	May 24
Independence Commemoration Day (Sri Lanka)	Feb. 4	Birthday of Prince Philip, Duke of Edinburgh	June 10
Accession of Queen Elizabeth II	Feb. 6	Dominion Day (Canada)	July 1
National Day (New Zealand)	Feb. 6	Remembrance Sunday	Nov. 13
St. David (Wales)	Mar. 1	Birthday of the Prince of Wales	Nov. 14
St. Patrick (Ireland)	Mar. 17	St. Andrew (Scotland)	Nov. 30
Birthday of Queen Elizabeth II	Apr. 21		

Bank Holidays in England and Wales—Jan. 1, Apr. 11, May 30, Aug. 29, Dec. 26, Dec. 27

Northern Ireland—Jan. 1, Mar. 17, Apr. 11, May 30, Aug. 29, Dec. 26, Dec. 27

Scotland—Jan. 1, Jan. 3, Apr. 8, May 2, Aug. 1, Dec. 26

Commonwealth Day may be observed in Great Britain on June 11

CIVIL CALENDAR—UNITED STATES OF AMERICA

New Year's Day	Jan. 1	Labor Day	Sept. 5
Lincoln's Birthday	Feb. 12	Columbus Day	Oct. 10
Washington's Birthday	Feb. 21	Veterans Day	Oct. 24
Memorial Day	May 30	Election Day (in certain States)	Nov. 8
Independence Day	July 4	Thanksgiving Day	Nov. 24

PHASES OF THE MOON

New Moon				First Quarter				Full Moon				Last Quarter			
	d	h	m		d	h	m		d	h	m		d	h	m
								Jan.	5	12	10	Jan.	12	19	55
Jan.	19	14	11	Jan.	27	05	11	Feb.	4	03	56	Feb.	11	04	07
Feb.	18	03	37	Feb.	26	02	50	Mar.	5	17	13	Mar.	12	11	35
Mar.	19	18	33	Mar.	27	22	27	Apr.	4	04	09	Apr.	10	19	15
Apr.	18	10	35	Apr.	26	14	42	May	3	13	03	May	10	04	08
May	18	02	51	May	26	03	20	June	1	20	31	June	8	15	07
June	16	18	23	June	24	12	44	July	1	03	24	July	8	04	39
July	16	08	37	July	23	19	38	July	30	10	52	Aug.	6	20	40
Aug.	14	21	31	Aug.	22	01	04	Aug.	28	20	10	Sept.	5	14	33
Sept.	13	09	23	Sept.	20	06	18	Sept.	27	08	17	Oct.	5	09	21
Oct.	12	20	31	Oct.	19	12	46	Oct.	26	23	35	Nov.	4	03	58
Nov.	11	07	09	Nov.	17	21	52	Nov.	25	17	31	Dec.	3	21	16
Dec.	10	17	33	Dec.	17	10	37	Dec.	25	12	49				

DAYS OF THE WEEK AND DAYS OF THE YEAR

Day of Month	JAN.		FEB.		MAR.		APR.		MAY		JUNE		JULY		AUG.		SEPT.		OCT.		NOV.		DEC.	
	Week	Year	Week	Year	Week	Year	Week	Year	Week	Year	Week	Year	Week	Year	Week	Year	Week	Year	Week	Year	Week	Year	Week	Year
1	S.	1	Tu.	32	Tu.	60	F.	91	𝕾.	121	W.	152	F.	182	M.	213	Th.	244	S.	274	Tu.	305	Th.	335
2	𝕾.	2	W.	33	W.	61	S.	92	M.	122	Th.	153	S.	183	Tu.	214	F.	245	𝕾.	275	W.	306	F.	336
3	M.	3	Th.	34	Th.	62	𝕾.	93	Tu.	123	F.	154	𝕾.	184	W.	215	S.	246	M.	276	Th.	307	S.	337
4	Tu.	4	F.	35	F.	63	M.	94	W.	124	S.	155	M.	185	Th.	216	𝕾.	247	Tu.	277	F.	308	𝕾.	338
5	W.	5	S.	36	S.	64	Tu.	95	Th.	125	𝕾.	156	Tu.	186	F.	217	M.	248	W.	278	S.	309	M.	339
6	Th.	6	𝕾.	37	𝕾.	65	W.	96	F.	126	M.	157	W.	187	S.	218	Tu.	249	Th.	279	𝕾.	310	Tu.	340
7	F.	7	M.	38	M.	66	Th.	97	S.	127	Tu.	158	Th.	188	𝕾.	219	W.	250	F.	280	M.	311	W.	341
8	S.	8	Tu.	39	Tu.	67	F.	98	𝕾.	128	W.	159	F.	189	M.	220	Th.	251	S.	281	Tu.	312	Th.	342
9	𝕾.	9	W.	40	W.	68	S.	99	M.	129	Th.	160	S.	190	Tu.	221	F.	252	𝕾.	282	W.	313	F.	343
10	M.	10	Th.	41	Th.	69	𝕾.	100	Tu.	130	F.	161	𝕾.	191	W.	222	S.	253	M.	283	Th.	314	S.	344
11	Tu.	11	F.	42	F.	70	M.	101	W.	131	S.	162	M.	192	Th.	223	𝕾.	254	Tu.	284	F.	315	𝕾.	345
12	W.	12	S.	43	S.	71	Tu.	102	Th.	132	𝕾.	163	Tu.	193	F.	224	M.	255	W.	285	S.	316	M.	346
13	Th.	13	𝕾.	44	𝕾.	72	W.	103	F.	133	M.	164	W.	194	S.	225	Tu.	256	Th.	286	𝕾.	317	Tu.	347
14	F.	14	M.	45	M.	73	Th.	104	S.	134	Tu.	165	Th.	195	𝕾.	226	W.	257	F.	287	M.	318	W.	348
15	S.	15	Tu.	46	Tu.	74	F.	105	𝕾.	135	W.	166	F.	196	M.	227	Th.	258	S.	288	Tu.	319	Th.	349
16	𝕾.	16	W.	47	W.	75	S.	106	M.	136	Th.	167	S.	197	Tu.	228	F.	259	𝕾.	289	W.	320	F.	350
17	M.	17	Th.	48	Th.	76	𝕾.	107	Tu.	137	F.	168	𝕾.	198	W.	229	S.	260	M.	290	Th.	321	S.	351
18	Tu.	18	F.	49	F.	77	M.	108	W.	138	S.	169	M.	199	Th.	230	𝕾.	261	Tu.	291	F.	322	𝕾.	352
19	W.	19	S.	50	S.	78	Tu.	109	Th.	139	𝕾.	170	Tu.	200	F.	231	M.	262	W.	292	S.	323	M.	353
20	Th.	20	𝕾.	51	𝕾.	79	W.	110	F.	140	M.	171	W.	201	S.	232	Tu.	263	Th.	293	𝕾.	324	Tu.	354
21	F.	21	M.	52	M.	80	Th.	111	S.	141	Tu.	172	Th.	202	𝕾.	233	W.	264	F.	294	M.	325	W.	355
22	S.	22	Tu.	53	Tu.	81	F.	112	𝕾.	142	W.	173	F.	203	M.	234	Th.	265	S.	295	Tu.	326	Th.	356
23	𝕾.	23	W.	54	W.	82	S.	113	M.	143	Th.	174	S.	204	Tu.	235	F.	266	𝕾.	296	W.	327	F.	357
24	M.	24	Th.	55	Th.	83	𝕾.	114	Tu.	144	F.	175	𝕾.	205	W.	236	S.	267	M.	297	Th.	328	S.	358
25	Tu.	25	F.	56	F.	84	M.	115	W.	145	S.	176	M.	206	Th.	237	𝕾.	268	Tu.	298	F.	329	𝕾.	359
26	W.	26	S.	57	S.	85	Tu.	116	Th.	146	𝕾.	177	Tu.	207	F.	238	M.	269	W.	299	S.	330	M.	360
27	Th.	27	𝕾.	58	𝕾.	86	W.	117	F.	147	M.	178	W.	208	S.	239	Tu.	270	Th.	300	𝕾.	331	Tu.	361
28	F.	28	M.	59	M.	87	Th.	118	S.	148	Tu.	179	Th.	209	𝕾.	240	W.	271	F.	301	M.	332	W.	362
29	S.	29			Tu.	88	F.	119	𝕾.	149	W.	180	F.	210	M.	241	Th.	272	S.	302	Tu.	333	Th.	363
30	𝕾.	30			W.	89	S.	120	M.	150	Th.	181	S.	211	Tu.	242	F.	273	𝕾.	303	W.	334	F.	364
31	M.	31			Th.	90			Tu.	151			𝕾.	212	W.	243			M.	304			S.	365

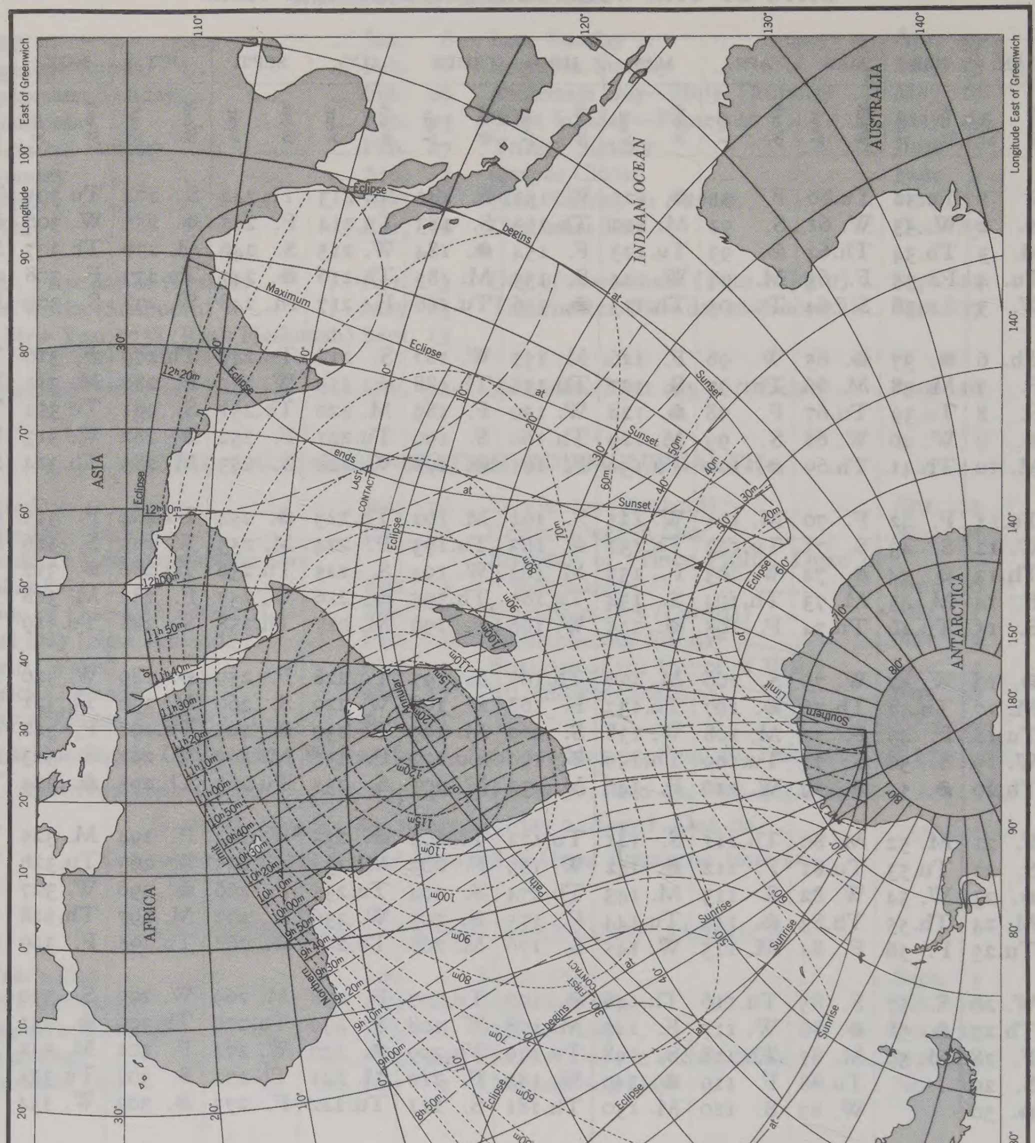
ECLIPSES

There are three eclipses, two of the Sun and one of the Moon.

1. *A Partial Eclipse of the Moon*, April 4. The eclipse begins at $03^h\ 30^m$ and ends at $05^h\ 06^m$. It is visible from western Africa, western Europe, the Atlantic Ocean, part of Antarctica, South America, North America except the north-western part, and the eastern half of the Pacific Ocean. At the time of maximum eclipse 0·20 of the Moon's diameter is obscured.

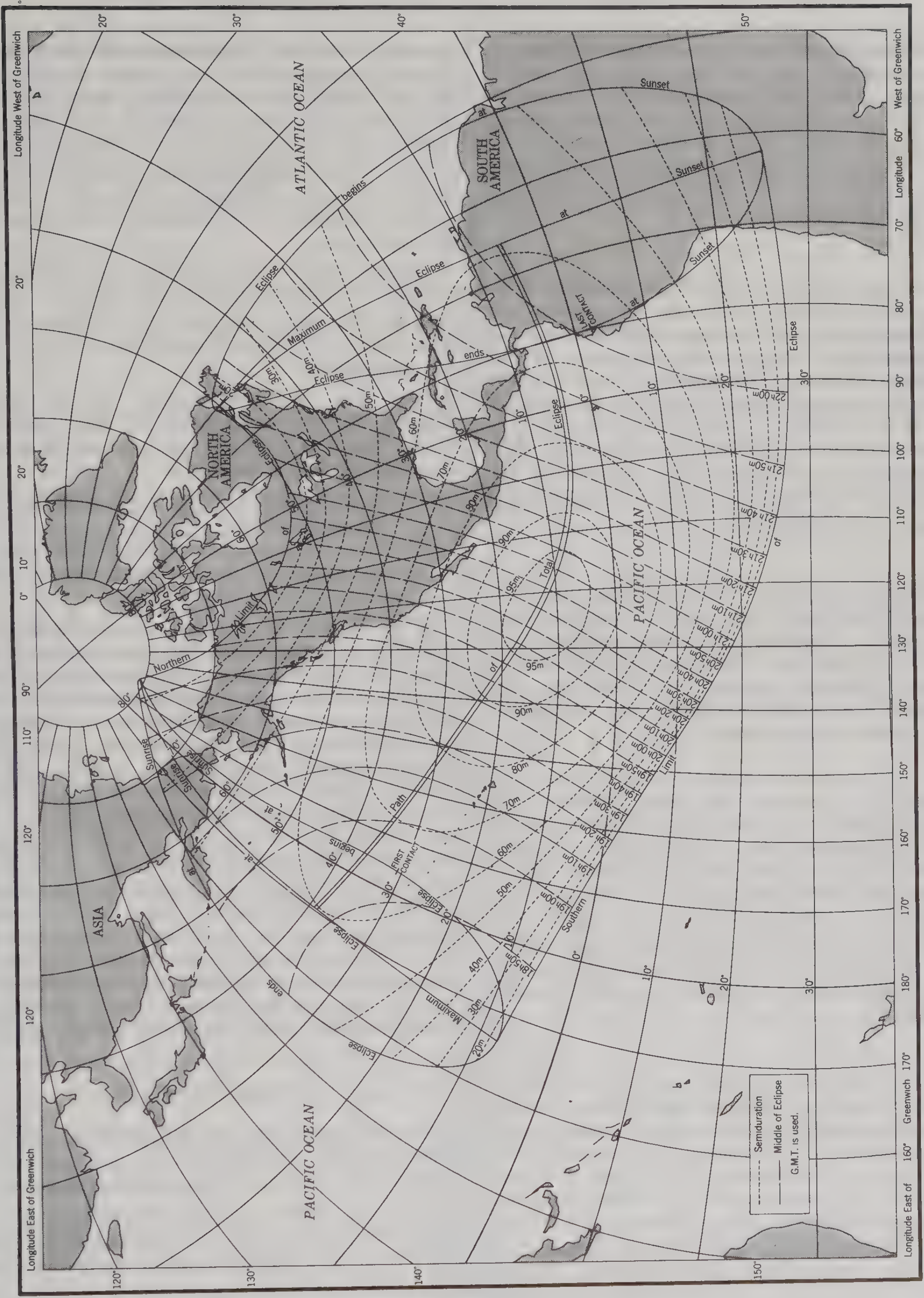
2. *An Annular Eclipse of the Sun*, April 18. See map on page 6. The eclipse begins at $07^h\ 33^m$ and ends at $13^h\ 29^m$; the annular phase begins at $08^h\ 43^m$ and ends at $12^h\ 19^m$. The maximum duration of the annular phase is $7^m\ 00^s$.

3. *A Total Eclipse of the Sun*, October 12. See map on page 7. The eclipse begins at $17^h\ 48^m$ and ends at $23^h\ 06^m$; the total phase begins at $18^h\ 49^m$ and ends at $22^h\ 05^m$. The maximum duration of the total phase is $2^m\ 37^s$.


ASIA
AFRICA
INDIAN OCEAN
AUSTRALIA
ANTARCTICA
ATLANTIC OCEAN
SOUTH AMERICA
Eclipse begins at Sunrise
Eclipse ends at Sunset
Maximum Eclipse at Sunset
Maximum Eclipse at Sunrise
Eclipse begins at Sunset
Eclipse ends at Sunrise
LAST CONTACT
FIRST CONTACT
Northern Limit of Eclipse
Southern Limit of Eclipse
Path of Annular Eclipse
Semiduration
Middle of Eclipse
G.M.T. is used.
Longitude East of Greenwich
Longitude West of Greenwich

SOLAR ECLIPSE DIAGRAMS

The principal features shown on the diagrams are: the paths of total and annular eclipses; the northern and southern limits of partial eclipse; the sunrise and sunset curves; contour lines showing the time of middle of eclipse and the semi-duration of partial eclipse. The times of beginning and end of partial eclipse at any place can be found by applying the semi-duration to the time of middle of the eclipse, both being interpolated for that place from the contour lines.


Longitude West of Greenwich
Longitude East of Greenwich
ATLANTIC OCEAN
PACIFIC OCEAN
PACIFIC OCEAN
SOUTH AMERICA
NORTH AMERICA
ASIA
Eclipse begins at Sunrise
Eclipse ends at Sunset
Maximum Eclipse at Sunrise
Maximum Eclipse at Sunset
Northern Limit of Eclipse
Southern Limit of Eclipse
Path of Total Eclipse
FIRST CONTACT
LAST CONTACT
95m
90m
80m
70m
60m
50m
40m
30m
20m
18h50m
19h00m
19h10m
19h20m
19h30m
19h40m
19h50m
20h00m
20h10m
20h20m
20h30m
20h40m
20h50m
21h00m
21h10m
21h20m
21h30m
21h40m
21h50m
22h00m
Semiduration
Middle of Eclipse
G.M.T. is used.

SOLAR ECLIPSE DIAGRAMS

For total and annular eclipses the mid-times of the total and annular phases are generally within 5 minutes of those given for the middle of eclipse; semi-durations, which depend on the precise position relative to the path, are not given. Further details of the paths and times of central eclipse are given in the *Astronomical Ephemeris* and in the *American Ephemeris*.

POSITIONS OF PLANETS

VENUS is easily identified by its superior brilliance. It is an evening star until the end of March when it becomes too close to the Sun for observation. From the middle of April it is a morning star until the beginning of December, when it again becomes too close to the Sun for observation. Venus is in conjunction with Mars on May 13 and June 3, with Jupiter on July 30 and Saturn on September 18.

MARS is too close to the Sun for observation during the first half of January; it is visible as a morning star for the remainder of the year. Mars is in Sagittarius from January until mid-February, and then moves through Capricornus, Aquarius, Pisces, Aries, Taurus (passing 5° N. of *Aldebaran* on August 1), Gemini (passing 6° S. of *Pollux* on October 13) and into Cancer later in October, where it remains for the rest of the year. Mars is in conjunction with Mercury on January 12 and February 12, with Venus on May 13 and June 3, and with Jupiter on September 4.

JUPITER is an evening star from the beginning of the year until the middle of May when it becomes too close to the Sun for observation. From the second half of June it is a morning star until opposition on December 23, when it becomes an evening star for the rest of the year. Jupiter is in conjunction with Venus on July 30, and with Mars on September 4.

SATURN is a morning star until opposition on February 2, when it becomes an evening star until the end of July. It is then too close to the Sun for observation until the end of August, when it becomes visible as a morning star for the remainder of the year. Saturn is in Cancer at the beginning of the year, moving into Leo in July where it remains for the rest of the year (passing 0°·8 N. of *Regulus* on November 3). Saturn is in conjunction with Mercury on July 20 and with Venus on September 18.

MERCURY can only be seen low in the east before sunrise, or low in the west after sunset (about the time of beginning or end of civil twilight). It is visible in the mornings during the following approximate dates: January 10 (+1·9) to March 4 (−0·7), May 7 (+2·5) to June 22 (−1·4), September 11 (+1·6) to October 5 (−1·1), December 26 (+2·2) to December 31 (+0·6); the planet is brighter at the end of each period. It is visible in the evenings between the following approximate dates: March 26 (−1·3) to April 24 (+2·5), July 9 (−1·0) to September 1 (+2·4), November 4 (−0·5) to December 17 (+1·7); the planet is brighter at the beginning of each period. The figures in parentheses are the magnitudes.

PLANET DIAGRAM

General Description. The diagram on the opposite page shows, in graphical form for any date during the year, the local mean time of meridian passage of the Sun, of the five planets Mercury, Venus, Mars, Jupiter, and Saturn, and of each 30° of S.H.A.; intermediate lines, corresponding to particular stars, may be drawn in by the user if he so desires. It is intended to provide a general picture of the availability of planets and stars for observation.

On each side of the line marking the time of meridian passage of the Sun a band, 45^m wide, is shaded to indicate that planets and most stars crossing the meridian within 45^m of the Sun are too close to the Sun for observation.

Method of use and interpretation. For any date the diagram provides immediately the local mean times of meridian passage of the Sun, planets and stars, and thus the following information:

(a) whether a planet or star is too close to the Sun for observation;
(b) whether a planet is a morning or evening star;
(c) some indication of its position during twilight;
(d) the proximity of other planets.

When the meridian passage occurs at midnight the body is in opposition to the Sun and is visible all night; planets may be observable in both morning and evening twilights. As the time of meridian passage decreases, the body ceases to be observable in the morning, but its altitude above the eastern horizon during evening twilight gradually increases; this continues until the body is on the meridian at twilight. From then onwards the body is observable above the western horizon and its altitude at evening twilight gradually decreases; eventually the body becomes too close to the Sun for observation. When the body again becomes visible it is seen as a morning star low in the east; its altitude at twilight increases until meridian passage occurs at the time of morning twilight. Then, as the time of meridian passage decreases to 0^h, the body is observable in the west in the morning twilight with a gradually decreasing altitude, until it once again reaches opposition.

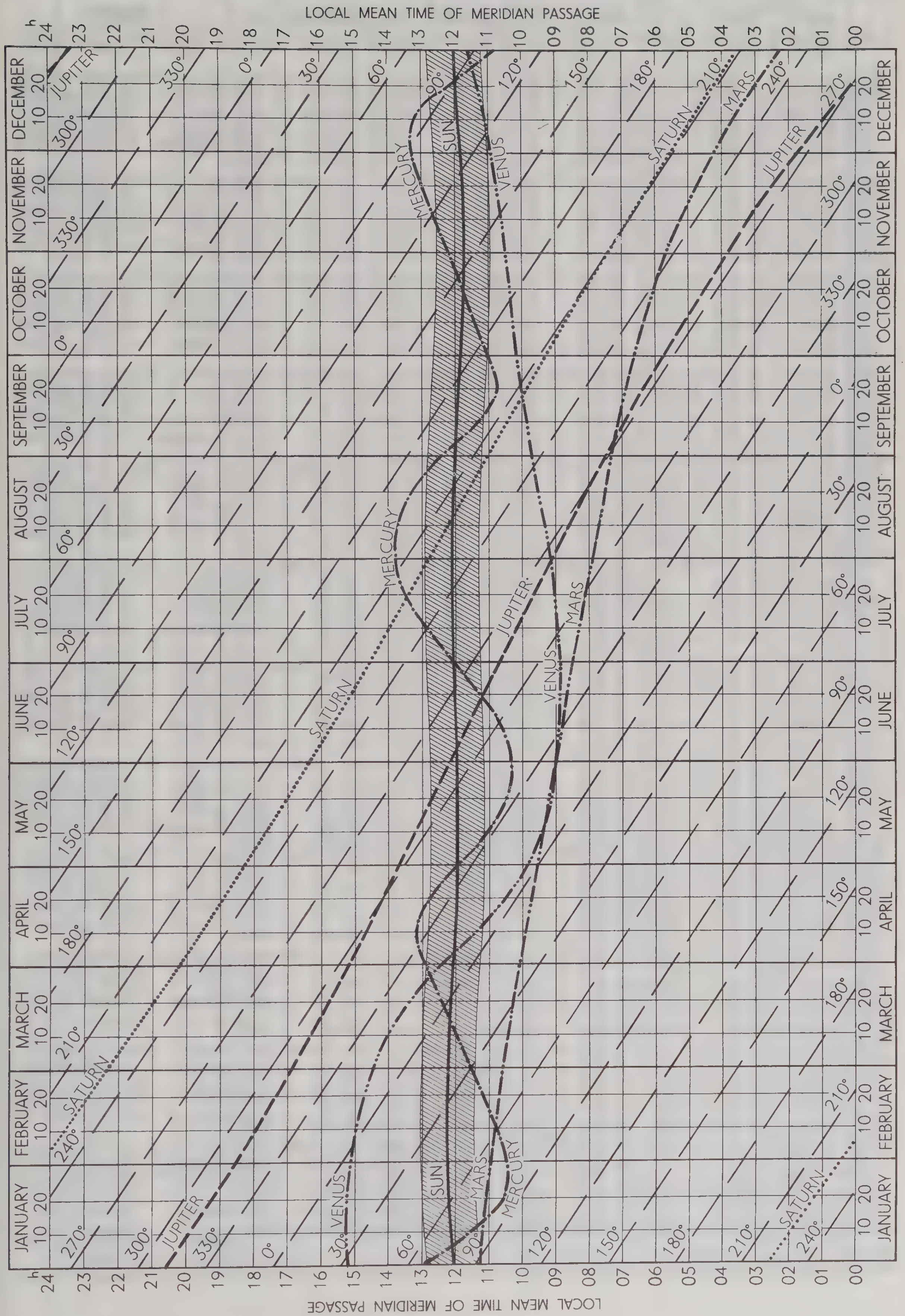
DO NOT CONFUSE

Mercury with Mars in mid-January when both planets have the same magnitude, and again in early February when Mercury is the brighter object.

Venus with Mars in the middle of May and early June, with Jupiter at the end of July, and with Saturn in the latter half of September; on all occasions Venus is the brighter object.

Mercury with Saturn in the latter half of July when Mercury is the brighter object.

Mars with Jupiter at the beginning of September when Jupiter is the brighter object.


LOCAL MEAN TIME OF MERIDIAN PASSAGE
h 24 23 22 21 20 19 18 17 16 15 14 13 12 11 10 09 08 07 06 05 04 03 02 01 00
JANUARY 10 20
FEBRUARY 10 20
MARCH 10 20
APRIL 10 20
MAY 10 20
JUNE 10 20
JULY 10 20
AUGUST 10 20
SEPTEMBER 10 20
OCTOBER 10 20
NOVEMBER 10 20
DECEMBER 10 20
SUN
MERCURY
VENUS
MARS
JUPITER
SATURN
0°
30°
60°
90°
120°
150°
180°
210°
240°
270°
300°
330°
LOCAL MEAN TIME OF MERIDIAN PASSAGE

1977 JANUARY 1, 2, 3 (SAT., SUN., MON.)

G.M.T.	ARIES	VENUS −3.8		MARS +1.6		JUPITER −2.2		SATURN +0.2	
	G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
d h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
1 00	100 31.9	131 42.2	S14 21.4	190 33.4	S24 03.6	51 09.4	N17 12.1	321 58.2	N16 55.9
01	115 34.4	146 42.0	20.3	205 33.8	03.6	66 12.0	12.0	337 00.8	55.9
02	130 36.8	161 41.8	19.2	220 34.2	03.7	81 14.6	12.0	352 03.4	56.0
03	145 39.3	176 41.5	·· 18.1	235 34.6	·· 03.7	96 17.2	·· 12.0	7 06.0	·· 56.0
04	160 41.8	191 41.3	17.0	250 35.0	03.7	111 19.8	12.0	22 08.6	56.1
05	175 44.2	206 41.1	15.9	265 35.5	03.7	126 22.4	12.0	37 11.2	56.1
06	190 46.7	221 40.9	S14 14.8	280 35.9	S24 03.8	141 25.0	N17 11.9	52 13.8	N16 56.2
07	205 49.2	236 40.6	13.8	295 36.3	03.8	156 27.5	11.9	67 16.4	56.2
S 08	220 51.6	251 40.4	12.7	310 36.7	03.8	171 30.1	11.9	82 19.0	56.3
A 09	235 54.1	266 40.2	·· 11.6	325 37.1	·· 03.8	186 32.7	·· 11.9	97 21.6	·· 56.3
T 10	250 56.6	281 40.0	10.5	340 37.5	03.8	201 35.3	11.9	112 24.2	56.4
U 11	265 59.0	296 39.7	09.4	355 38.0	03.9	216 37.9	11.8	127 26.9	56.4
R 12	281 01.5	311 39.5	S14 08.3	10 38.4	S24 03.9	231 40.5	N17 11.8	142 29.5	N16 56.5
D 13	296 04.0	326 39.3	07.2	25 38.8	03.9	246 43.1	11.8	157 32.1	56.5
A 14	311 06.4	341 39.1	06.1	40 39.2	03.9	261 45.7	11.8	172 34.7	56.6
Y 15	326 08.9	356 38.9	·· 05.0	55 39.6	·· 03.9	276 48.2	·· 11.8	187 37.3	·· 56.6
16	341 11.3	11 38.7	03.9	70 40.0	03.9	291 50.8	11.7	202 39.9	56.7
17	356 13.8	26 38.4	02.8	85 40.5	04.0	306 53.4	11.7	217 42.5	56.7
18	11 16.3	41 38.2	S14 01.7	100 40.9	S24 04.0	321 56.0	N17 11.7	232 45.1	N16 56.8
19	26 18.7	56 38.0	14 00.6	115 41.3	04.0	336 58.6	11.7	247 47.7	56.8
20	41 21.2	71 37.8	13 59.6	130 41.7	04.0	352 01.2	11.7	262 50.3	56.9
21	56 23.7	86 37.6	·· 58.5	145 42.1	·· 04.0	7 03.8	·· 11.6	277 53.0	·· 56.9
22	71 26.1	101 37.4	57.4	160 42.5	04.0	22 06.3	11.6	292 55.6	57.0
23	86 28.6	116 37.2	56.3	175 43.0	04.0	37 08.9	11.6	307 58.2	57.0
2 00	101 31.1	131 36.9	S13 55.2	190 43.4	S24 04.1	52 11.5	N17 11.6	323 00.8	N16 57.1
01	116 33.5	146 36.7	54.1	205 43.8	04.1	67 14.1	11.6	338 03.4	57.2
02	131 36.0	161 36.5	53.0	220 44.2	04.1	82 16.7	11.5	353 06.0	57.2
03	146 38.5	176 36.3	·· 51.9	235 44.6	·· 04.1	97 19.3	·· 11.5	8 08.6	·· 57.3
04	161 40.9	191 36.1	50.8	250 45.0	04.1	112 21.8	11.5	23 11.2	57.3
05	176 43.4	206 35.9	49.7	265 45.5	04.1	127 24.4	11.5	38 13.8	57.4
06	191 45.8	221 35.7	S13 48.6	280 45.9	S24 04.1	142 27.0	N17 11.5	53 16.5	N16 57.4
07	206 48.3	236 35.5	47.5	295 46.3	04.1	157 29.6	11.4	68 19.1	57.5
08	221 50.8	251 35.3	46.4	310 46.7	04.1	172 32.2	11.4	83 21.7	57.5
S 09	236 53.2	266 35.1	·· 45.3	325 47.1	·· 04.2	187 34.8	·· 11.4	98 24.3	·· 57.6
U 10	251 55.7	281 34.9	44.2	340 47.5	04.2	202 37.3	11.4	113 26.9	57.6
N 11	266 58.2	296 34.7	43.1	355 48.0	04.2	217 39.9	11.4	128 29.5	57.7
D 12	282 00.6	311 34.5	S13 42.0	10 48.4	S24 04.2	232 42.5	N17 11.4	143 32.1	N16 57.7
A 13	297 03.1	326 34.3	40.9	25 48.8	04.2	247 45.1	11.3	158 34.7	57.8
Y 14	312 05.6	341 34.1	39.7	40 49.2	04.2	262 47.6	11.3	173 37.3	57.8
15	327 08.0	356 33.9	·· 38.6	55 49.6	·· 04.2	277 50.2	·· 11.3	188 40.0	·· 57.9
16	342 10.5	11 33.7	37.5	70 50.0	04.2	292 52.8	11.3	203 42.6	57.9
17	357 12.9	26 33.5	36.4	85 50.4	04.2	307 55.4	11.3	218 45.2	58.0
18	12 15.4	41 33.3	S13 35.3	100 50.9	S24 04.2	322 58.0	N17 11.3	233 47.8	N16 58.0
19	27 17.9	56 33.1	34.2	115 51.3	04.2	338 00.5	11.2	248 50.4	58.1
20	42 20.3	71 32.9	33.1	130 51.7	04.2	353 03.1	11.2	263 53.0	58.1
21	57 22.8	86 32.7	·· 32.0	145 52.1	·· 04.2	8 05.7	·· 11.2	278 55.6	·· 58.2
22	72 25.3	101 32.5	30.9	160 52.5	04.2	23 08.3	11.2	293 58.3	58.2
23	87 27.7	116 32.3	29.8	175 52.9	04.2	38 10.8	11.2	309 00.9	58.3
3 00	102 30.2	131 32.1	S13 28.7	190 53.4	S24 04.2	53 13.4	N17 11.2	324 03.5	N16 58.3
01	117 32.7	146 32.0	27.6	205 53.8	04.2	68 16.0	11.1	339 06.1	58.4
02	132 35.1	161 31.8	26.5	220 54.2	04.2	83 18.6	11.1	354 08.7	58.4
03	147 37.6	176 31.6	·· 25.3	235 54.6	·· 04.2	98 21.1	·· 11.1	9 11.3	·· 58.5
04	162 40.1	191 31.4	24.2	250 55.0	04.2	113 23.7	11.1	24 13.9	58.5
05	177 42.5	206 31.2	23.1	265 55.4	04.2	128 26.3	11.1	39 16.6	58.6
06	192 45.0	221 31.0	S13 22.0	280 55.8	S24 04.2	143 28.9	N17 11.1	54 19.2	N16 58.6
07	207 47.4	236 30.8	20.9	295 56.2	04.2	158 31.4	11.0	69 21.8	58.7
08	222 49.9	251 30.6	19.8	310 56.7	04.2	173 34.0	11.0	84 24.4	58.7
M 09	237 52.4	266 30.5	·· 18.7	325 57.1	·· 04.2	188 36.6	·· 11.0	99 27.0	·· 58.8
O 10	252 54.8	281 30.3	17.6	340 57.5	04.2	203 39.2	11.0	114 29.6	58.9
N 11	267 57.3	296 30.1	16.4	355 57.9	04.2	218 41.7	11.0	129 32.3	58.9
D 12	282 59.8	311 29.9	S13 15.3	10 58.3	S24 04.2	233 44.3	N17 11.0	144 34.9	N16 59.0
A 13	298 02.2	326 29.7	14.2	25 58.7	04.2	248 46.9	10.9	159 37.5	59.0
Y 14	313 04.7	341 29.6	13.1	40 59.1	04.2	263 49.4	10.9	174 40.1	59.1
15	328 07.2	356 29.4	·· 12.0	55 59.6	·· 04.2	278 52.0	·· 10.9	189 42.7	·· 59.1
16	343 09.6	11 29.2	10.9	71 00.0	04.2	293 54.6	10.9	204 45.3	59.2
17	358 12.1	26 29.0	09.7	86 00.4	04.2	308 57.1	10.9	219 47.9	59.2
18	13 14.6	41 28.8	S13 08.6	101 00.8	S24 04.2	323 59.7	N17 10.9	234 50.6	N16 59.3
19	28 17.0	56 28.7	07.5	116 01.2	04.2	339 02.3	10.9	249 53.2	59.3
20	43 19.5	71 28.5	06.4	131 01.6	04.2	354 04.9	10.8	264 55.8	59.4
21	58 21.9	86 28.3	·· 05.3	146 02.0	·· 04.2	9 07.4	·· 10.8	279 58.4	·· 59.4
22	73 24.4	101 28.2	04.1	161 02.4	04.2	24 10.0	10.8	295 01.0	59.5
23	88 26.9	116 28.0	03.0	176 02.9	04.2	39 12.6	10.8	310 03.7	59.5
Mer. Pass.	h m 17 11.1	*v* −0.2	*d* 1.1	*v* 0.4	*d* 0.0	*v* 2.6	*d* 0.0	*v* 2.6	*d* 0.1

STARS

Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 38.9	S40 24.0
Achernar	335 47.1	S57 21.5
Acrux	173 39.8	S62 58.1
Adhara	255 33.7	S28 56.6
Aldebaran	291 20.5	N16 27.8
Alioth	166 44.8	N56 04.7
Alkaid	153 20.7	N49 25.4
Al Na'ir	28 18.4	S47 04.5
Alnilam	276 13.9	S 1 13.1
Alphard	218 22.7	S 8 33.6
Alphecca	126 34.5	N26 47.4
Alpheratz	358 11.9	N28 58.0
Altair	62 35.3	N 8 48.5
Ankaa	353 42.8	S42 26.1
Antares	113 00.2	S26 22.8
Arcturus	146 20.9	N19 18.0
Atria	108 27.2	S68 59.0
Avior	234 28.5	S59 26.2
Bellatrix	279 01.1	N 6 19.7
Betelgeuse	271 30.6	N 7 24.1
Canopus	264 07.7	S52 41.1
Capella	281 14.5	N45 58.5
Deneb	49 50.5	N45 12.1
Denebola	183 01.5	N14 41.9
Diphda	349 23.4	S18 06.9
Dubhe	194 25.0	N61 52.1
Elnath	278 46.9	N28 35.3
Eltanin	90 59.4	N51 29.5
Enif	34 14.3	N 9 46.3
Fomalhaut	15 54.4	S29 44.7
Gacrux	172 31.4	S56 58.8
Gienah	176 20.5	S17 24.8
Hadar	149 27.0	S60 15.5
Hamal	328 31.6	N23 21.3
Kaus Aust.	84 20.6	S34 23.7
Kochab	137 19.7	N74 14.7
Markab	14 05.8	N15 05.0
Menkar	314 43.5	N 4 00.0
Menkent	148 40.1	S36 15.3
Miaplacidus	221 44.6	S69 37.3
Mirfak	309 19.3	N49 46.9
Nunki	76 32.6	S26 19.5
Peacock	54 02.9	S56 48.6
Pollux	244 00.8	N28 04.8
Procyon	245 28.1	N 5 16.9
Rasalhague	96 32.2	N12 34.6
Regulus	208 12.4	N12 04.6
Rigel	281 38.1	S 8 13.8
Rigil Kent.	140 29.4	S60 44.1
Sabik	102 44.3	S15 41.7
Schedar	350 11.8	N56 25.0
Shaula	96 59.5	S37 05.1
Sirius	258 57.5	S16 41.2
Spica	159 00.2	S11 02.5
Suhail	223 12.2	S43 20.4
Vega	80 57.9	N38 45.8
Zuben'ubi	137 36.0	S15 56.7

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	30 05.9	15 14
Mars	89 12.3	11 17
Jupiter	310 40.5	20 28
Saturn	221 29.7	2 28

G.M.T.		SUN G.H.A.	SUN Dec.	MOON G.H.A.	*v*	MOON Dec.	*d*	H.P.
d h		° ′	° ′	° ′	′	° ′	′	′
1 00		179 08.9	S23 01.7	52 14.7	13.1	N16 12.6	5.4	54.2
01		194 08.6	01.5	66 46.8	13.1	16 18.0	5.3	54.2
02		209 08.3	01.3	81 18.9	13.0	16 23.3	5.3	54.2
03		224 08.0	· · 01.1	95 50.9	13.1	16 28.6	5.1	54.2
04		239 07.7	00.9	110 23.0	12.9	16 33.7	5.1	54.2
05		254 07.5	00.6	124 54.9	13.0	16 38.8	5.1	54.2
06		269 07.2	S23 00.4	139 26.9	12.9	N16 43.9	4.9	54.2
07		284 06.9	00.2	153 58.8	12.9	16 48.8	4.9	54.2
08	S	299 06.6	23 00.0	168 30.7	12.8	16 53.7	4.9	54.2
09	A	314 06.3	22 59.8	183 02.5	12.8	16 58.6	4.7	54.2
10	T	329 06.0	59.6	197 34.3	12.8	17 03.3	4.7	54.2
11	U	344 05.7	59.4	212 06.1	12.7	17 08.0	4.6	54.2
12	R	359 05.4	S22 59.2	226 37.8	12.7	N17 12.6	4.5	54.2
13	D	14 05.1	59.0	241 09.5	12.7	17 17.1	4.4	54.2
14	A	29 04.8	58.8	255 41.2	12.6	17 21.5	4.4	54.2
15	Y	44 04.5	· · 58.6	270 12.8	12.6	17 25.9	4.3	54.2
16		59 04.2	58.4	284 44.4	12.6	17 30.2	4.2	54.2
17		74 03.9	58.1	299 16.0	12.5	17 34.4	4.1	54.3
18		89 03.6	S22 57.9	313 47.5	12.5	N17 38.5	4.0	54.3
19		104 03.3	57.7	328 19.0	12.4	17 42.5	4.0	54.3
20		119 03.1	57.5	342 50.4	12.5	17 46.5	3.9	54.3
21		134 02.8	· · 57.3	357 21.9	12.3	17 50.4	3.8	54.3
22		149 02.5	57.1	11 53.2	12.4	17 54.2	3.8	54.3
23		164 02.2	56.9	26 24.6	12.3	17 58.0	3.6	54.3
2 00		179 01.9	S22 56.6	40 55.9	12.3	N18 01.6	3.6	54.3
01		194 01.6	56.4	55 27.2	12.2	18 05.2	3.5	54.3
02		209 01.3	56.2	69 58.4	12.2	18 08.7	3.4	54.3
03		224 01.0	· · 56.0	84 29.6	12.2	18 12.1	3.3	54.3
04		239 00.7	55.7	99 00.8	12.2	18 15.4	3.2	54.3
05		254 00.4	55.5	113 32.0	12.1	18 18.6	3.2	54.4
06		269 00.1	S22 55.3	128 03.1	12.0	N18 21.8	3.1	54.4
07		283 59.8	55.1	142 34.1	12.1	18 24.9	3.0	54.4
08		298 59.6	54.9	157 05.2	12.0	18 27.9	2.9	54.4
09	S	313 59.3	· · 54.6	171 36.2	12.0	18 30.8	2.8	54.4
10	U	328 59.0	54.4	186 07.2	11.9	18 33.6	2.7	54.4
11	N	343 58.7	54.2	200 38.1	11.9	18 36.3	2.7	54.4
12	D	358 58.4	S22 53.9	215 09.0	11.9	N18 39.0	2.5	54.4
13	A	13 58.1	53.7	229 39.9	11.9	18 41.5	2.5	54.4
14	Y	28 57.8	53.5	244 10.8	11.8	18 44.0	2.4	54.5
15		43 57.5	· · 53.3	258 41.6	11.8	18 46.4	2.3	54.5
16		58 57.2	53.0	273 12.4	11.7	18 48.7	2.2	54.5
17		73 56.9	52.8	287 43.1	11.8	18 50.9	2.1	54.5
18		88 56.7	S22 52.6	302 13.9	11.7	N18 53.0	2.1	54.5
19		103 56.4	52.3	316 44.6	11.6	18 55.1	1.9	54.5
20		118 56.1	52.1	331 15.2	11.7	18 57.0	1.9	54.5
21		133 55.8	· · 51.9	345 45.9	11.6	18 58.9	1.8	54.5
22		148 55.5	51.6	0 16.5	11.6	19 00.7	1.6	54.6
23		163 55.2	51.4	14 47.1	11.5	19 02.3	1.6	54.6
3 00		178 54.9	S22 51.1	29 17.6	11.6	N19 03.9	1.5	54.6
01		193 54.6	50.9	43 48.2	11.5	19 05.4	1.4	54.6
02		208 54.4	50.7	58 18.7	11.4	19 06.8	1.4	54.6
03		223 54.1	· · 50.4	72 49.1	11.5	19 08.2	1.2	54.6
04		238 53.8	50.2	87 19.6	11.4	19 09.4	1.1	54.6
05		253 53.5	49.9	101 50.0	11.4	19 10.5	1.1	54.6
06		268 53.2	S22 49.7	116 20.4	11.3	N19 11.6	0.9	54.7
07		283 52.9	49.5	130 50.7	11.4	19 12.5	0.9	54.7
08		298 52.6	49.2	145 21.1	11.3	19 13.4	0.8	54.7
09	M	313 52.3	· · 49.0	159 51.4	11.3	19 14.2	0.6	54.7
10	O	328 52.1	48.7	174 21.7	11.3	19 14.8	0.6	54.7
11	N	343 51.8	48.5	188 52.0	11.2	19 15.4	0.5	54.7
12	D	358 51.5	S22 48.2	203 22.2	11.3	N19 15.9	0.4	54.7
13	A	13 51.2	48.0	217 52.5	11.2	19 16.3	0.3	54.8
14	Y	28 50.9	47.7	232 22.7	11.1	19 16.6	0.2	54.8
15		43 50.6	· · 47.5	246 52.8	11.2	19 16.8	0.1	54.8
16		58 50.3	47.2	261 23.0	11.1	19 16.9	0.1	54.8
17		73 50.1	47.0	275 53.1	11.2	19 17.0	0.1	54.8
18		88 49.8	S22 46.7	290 23.3	11.1	N19 16.9	0.2	54.8
19		103 49.5	46.5	304 53.4	11.0	19 16.7	0.3	54.9
20		118 49.2	46.2	319 23.4	11.1	19 16.4	0.3	54.9
21		133 48.9	· · 46.0	333 53.5	11.1	19 16.1	0.5	54.9
22		148 48.6	45.7	348 23.6	11.0	19 15.6	0.5	54.9
23		163 48.3	45.5	2 53.6	11.0	19 15.1	0.7	54.9
		S.D. 16.3	*d* 0.2	S.D. 14.8		14.8		14.9

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 1	Moonrise 2	Moonrise 3	Moonrise 4
°	h m	h m	h m	h m	h m	h m	h m
N 72	08 23	10 40	■	10 10	□	□	□
N 70	08 04	09 48	■	11 02	11 10	11 35	12 36
68	07 49	09 16	■	11 35	11 55	12 30	13 27
66	07 37	08 52	10 26	11 58	12 24	13 03	13 59
64	07 26	08 34	09 49	12 17	12 47	13 28	14 22
62	07 17	08 18	09 22	12 33	13 04	13 47	14 41
60	07 09	08 05	09 02	12 46	13 19	14 02	14 56
N 58	07 02	07 54	08 45	12 57	13 32	14 16	15 09
56	06 56	07 44	08 31	13 06	13 43	14 27	15 20
54	06 50	07 36	08 19	13 15	13 53	14 37	15 30
52	06 44	07 28	08 08	13 23	14 01	14 46	15 39
50	06 39	07 20	07 59	13 30	14 09	14 54	15 47
45	06 28	07 05	07 38	13 45	14 25	15 12	16 03
N 40	06 18	06 52	07 22	13 57	14 39	15 26	16 17
35	06 09	06 40	07 08	14 07	14 50	15 38	16 29
30	06 00	06 30	06 56	14 17	15 00	15 48	16 39
20	05 44	06 12	06 36	14 32	15 18	16 06	16 56
N 10	05 28	05 55	06 17	14 46	15 33	16 21	17 12
0	05 12	05 38	06 00	15 00	15 47	16 36	17 26
S 10	04 53	05 20	05 43	15 13	16 01	16 51	17 40
20	04 31	05 00	05 25	15 27	16 17	17 06	17 55
30	04 03	04 36	05 03	15 43	16 34	17 24	18 13
35	03 44	04 21	04 50	15 52	16 44	17 35	18 23
40	03 22	04 03	04 36	16 03	16 56	17 47	18 35
45	02 52	03 41	04 18	16 16	17 10	18 01	18 48
S 50	02 09	03 12	03 56	16 31	17 27	18 18	19 05
52	01 43	02 58	03 46	16 38	17 35	18 26	19 13
54	01 03	02 41	03 34	16 46	17 44	18 36	19 21
56	////	02 19	03 20	16 56	17 54	18 46	19 31
58	////	01 52	03 04	17 06	18 05	18 57	19 42
S 60	////	01 09	02 44	17 18	18 18	19 11	19 55

Lat.	Sunset	Twilight Civil	Twilight Naut.	Moonset 1	Moonset 2	Moonset 3	Moonset 4
°	h m	h m	h m	h m	h m	h m	h m
N 72	■	13 29	15 46	07 16	□	□	□
N 70	■	14 20	16 04	06 24	07 55	09 11	09 53
68	■	14 53	16 19	05 53	07 10	08 16	09 02
66	13 42	15 16	16 32	05 29	06 41	07 43	08 30
64	14 20	15 35	16 42	05 11	06 19	07 18	08 06
62	14 46	15 50	16 51	04 56	06 01	06 59	07 47
60	15 07	16 03	16 59	04 44	05 47	06 43	07 32
N 58	15 23	16 14	17 06	04 33	05 34	06 30	07 19
56	15 37	16 24	17 13	04 23	05 24	06 19	07 08
54	15 50	16 33	17 19	04 15	05 14	06 09	06 58
52	16 00	16 41	17 24	04 08	05 06	06 00	06 49
50	16 10	16 48	17 29	04 01	04 58	05 52	06 41
45	16 30	17 04	17 41	03 47	04 42	05 35	06 24
N 40	16 46	17 17	17 51	03 35	04 29	05 21	06 10
35	17 00	17 28	18 00	03 25	04 17	05 09	05 58
30	17 12	17 38	18 08	03 16	04 08	04 58	05 48
20	17 33	17 57	18 24	03 01	03 51	04 41	05 30
N 10	17 51	18 14	18 40	02 48	03 36	04 25	05 15
0	18 08	18 30	18 56	02 35	03 22	04 11	05 00
S 10	18 25	18 48	19 15	02 23	03 09	03 56	04 45
20	18 43	19 08	19 37	02 10	02 54	03 41	04 30
30	19 05	19 32	20 05	01 55	02 37	03 23	04 12
35	19 18	19 47	20 23	01 46	02 27	03 12	04 02
40	19 32	20 05	20 46	01 36	02 16	03 00	03 50
45	19 50	20 27	21 15	01 25	02 03	02 46	03 36
S 50	20 12	20 55	21 59	01 11	01 47	02 29	03 18
52	20 22	21 10	22 24	01 04	01 40	02 21	03 10
54	20 34	21 27	23 03	00 57	01 31	02 12	03 01
56	20 47	21 48	////	00 49	01 22	02 02	02 51
58	21 03	22 15	////	00 40	01 12	01 51	02 39
S 60	21 23	22 57	////	00 30	00 59	01 38	02 26

Day	SUN Eqn. of Time 00ʰ	SUN Eqn. of Time 12ʰ	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
	m s	m s	h m	h m	h m	d	
1	03 24	03 38	12 04	21 11	08 47	11	◐
2	03 52	04 06	12 04	21 59	09 35	12	
3	04 20	04 33	12 05	22 48	10 23	13	

1977 JANUARY 4, 5, 6 (TUES., WED., THURS.)

	G.M.T.	ARIES	VENUS −3.9		MARS +1.6		JUPITER −2.2		SATURN +0.2	
		G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
	d h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
	4 00	103 29.3	131 27.8	S13 01.9	191 03.3	S24 04.2	54 15.1	N17 10.8	325 06.3	N16 59.6
	01	118 31.8	146 27.6	13 00.8	206 03.7	04.2	69 17.7	10.8	340 08.9	59.6
	02	133 34.3	161 27.5	12 59.7	221 04.1	04.1	84 20.3	10.8	355 11.5	59.7
	03	148 36.7	176 27.3	·· 58.5	236 04.5	·· 04.1	99 22.8	·· 10.7	10 14.1	·· 59.7
	04	163 39.2	191 27.1	57.4	251 04.9	04.1	114 25.4	10.7	25 16.7	59.8
	05	178 41.7	206 27.0	56.3	266 05.3	04.1	129 28.0	10.7	40 19.4	59.8
	06	193 44.1	221 26.8	S12 55.2	281 05.7	S24 04.1	144 30.5	N17 10.7	55 22.0	N16 59.9
	07	208 46.6	236 26.6	54.0	296 06.2	04.1	159 33.1	10.7	70 24.6	17 00.0
	08	223 49.0	251 26.5	52.9	311 06.6	04.1	174 35.6	10.7	85 27.2	00.0
T	09	238 51.5	266 26.3	·· 51.8	326 07.0	·· 04.1	189 38.2	·· 10.7	100 29.8	·· 00.1
U	10	253 54.0	281 26.1	50.7	341 07.4	04.1	204 40.8	10.6	115 32.4	00.1
E	11	268 56.4	296 26.0	49.5	356 07.8	04.0	219 43.3	10.6	130 35.1	00.2
S	12	283 58.9	311 25.8	S12 48.4	11 08.2	S24 04.0	234 45.9	N17 10.6	145 37.7	N17 00.2
D	13	299 01.4	326 25.7	47.3	26 08.6	04.0	249 48.5	10.6	160 40.3	00.3
A	14	314 03.8	341 25.5	46.2	41 09.0	04.0	264 51.0	10.6	175 42.9	00.3
Y	15	329 06.3	356 25.3	·· 45.0	56 09.5	·· 04.0	279 53.6	·· 10.6	190 45.5	·· 00.4
	16	344 08.8	11 25.2	43.9	71 09.9	04.0	294 56.1	10.6	205 48.2	00.4
	17	359 11.2	26 25.0	42.8	86 10.3	03.9	309 58.7	10.5	220 50.8	00.5
	18	14 13.7	41 24.9	S12 41.6	101 10.7	S24 03.9	325 01.3	N17 10.5	235 53.4	N17 00.5
	19	29 16.2	56 24.7	40.5	116 11.1	03.9	340 03.8	10.5	250 56.0	00.6
	20	44 18.6	71 24.6	39.4	131 11.5	03.9	355 06.4	10.5	265 58.6	00.6
	21	59 21.1	86 24.4	·· 38.3	146 11.9	·· 03.9	10 08.9	·· 10.5	281 01.3	·· 00.7
	22	74 23.5	101 24.2	37.1	161 12.3	03.9	25 11.5	10.5	296 03.9	00.7
	23	89 26.0	116 24.1	36.0	176 12.7	03.8	40 14.1	10.5	311 06.5	00.8
	5 00	104 28.5	131 23.9	S12 34.9	191 13.1	S24 03.8	55 16.6	N17 10.5	326 09.1	N17 00.9
	01	119 30.9	146 23.8	33.7	206 13.6	03.8	70 19.2	10.4	341 11.7	00.9
	02	134 33.4	161 23.6	32.6	221 14.0	03.8	85 21.7	10.4	356 14.4	01.0
	03	149 35.9	176 23.5	·· 31.5	236 14.4	·· 03.8	100 24.3	·· 10.4	11 17.0	·· 01.0
	04	164 38.3	191 23.3	30.3	251 14.8	03.7	115 26.8	10.4	26 19.6	01.1
	05	179 40.8	206 23.2	29.2	266 15.2	03.7	130 29.4	10.4	41 22.2	01.1
	06	194 43.3	221 23.0	S12 28.1	281 15.6	S24 03.7	145 32.0	N17 10.4	56 24.9	N17 01.2
W	07	209 45.7	236 22.9	26.9	296 16.0	03.7	160 34.5	10.4	71 27.5	01.2
E	08	224 48.2	251 22.8	25.8	311 16.4	03.7	175 37.1	10.4	86 30.1	01.3
D	09	239 50.7	266 22.6	·· 24.6	326 16.8	·· 03.6	190 39.6	·· 10.4	101 32.7	·· 01.3
N	10	254 53.1	281 22.5	23.5	341 17.3	03.6	205 42.2	10.3	116 35.3	01.4
E	11	269 55.6	296 22.3	22.4	356 17.7	03.6	220 44.7	10.3	131 38.0	01.4
S	12	284 58.0	311 22.2	S12 21.2	11 18.1	S24 03.6	235 47.3	N17 10.3	146 40.6	N17 01.5
D	13	300 00.5	326 22.0	20.1	26 18.5	03.5	250 49.8	10.3	161 43.2	01.6
A	14	315 03.0	341 21.9	19.0	41 18.9	03.5	265 52.4	10.3	176 45.8	01.6
Y	15	330 05.4	356 21.8	·· 17.8	56 19.3	·· 03.5	280 54.9	·· 10.3	191 48.5	·· 01.7
	16	345 07.9	11 21.6	16.7	71 19.7	03.5	295 57.5	10.3	206 51.1	01.7
	17	0 10.4	26 21.5	15.5	86 20.1	03.4	311 00.1	10.3	221 53.7	01.8
	18	15 12.8	41 21.4	S12 14.4	101 20.5	S24 03.4	326 02.6	N17 10.3	236 56.3	N17 01.8
	19	30 15.3	56 21.2	13.3	116 20.9	03.4	341 05.2	10.2	251 58.9	01.9
	20	45 17.8	71 21.1	12.1	131 21.3	03.3	356 07.7	10.2	267 01.6	01.9
	21	60 20.2	86 20.9	·· 11.0	146 21.8	·· 03.3	11 10.3	·· 10.2	282 04.2	·· 02.0
	22	75 22.7	101 20.8	09.8	161 22.2	03.3	26 12.8	10.2	297 06.8	02.0
	23	90 25.2	116 20.7	08.7	176 22.6	03.3	41 15.4	10.2	312 09.4	02.1
	6 00	105 27.6	131 20.5	S12 07.6	191 23.0	S24 03.2	56 17.9	N17 10.2	327 12.1	N17 02.1
	01	120 30.1	146 20.4	06.4	206 23.4	03.2	71 20.5	10.2	342 14.7	02.2
	02	135 32.5	161 20.3	05.3	221 23.8	03.2	86 23.0	10.2	357 17.3	02.3
	03	150 35.0	176 20.2	·· 04.1	236 24.2	·· 03.1	101 25.6	·· 10.2	12 19.9	·· 02.3
	04	165 37.5	191 20.0	03.0	251 24.6	03.1	116 28.1	10.2	27 22.6	02.4
	05	180 39.9	206 19.9	01.8	266 25.0	03.1	131 30.7	10.1	42 25.2	02.4
	06	195 42.4	221 19.8	S12 00.7	281 25.4	S24 03.0	146 33.2	N17 10.1	57 27.8	N17 02.5
	07	210 44.9	236 19.6	11 59.5	296 25.8	03.0	161 35.7	10.1	72 30.4	02.5
T	08	225 47.3	251 19.5	58.4	311 26.3	03.0	176 38.3	10.1	87 33.1	02.6
H	09	240 49.8	266 19.4	·· 57.3	326 26.7	·· 02.9	191 40.8	·· 10.1	102 35.7	·· 02.6
U	10	255 52.3	281 19.3	56.1	341 27.1	02.9	206 43.4	10.1	117 38.3	02.7
R	11	270 54.7	296 19.1	55.0	356 27.5	02.9	221 45.9	10.1	132 40.9	02.7
S	12	285 57.2	311 19.0	S11 53.8	11 27.9	S24 02.8	236 48.5	N17 10.1	147 43.6	N17 02.8
D	13	300 59.6	326 18.9	52.7	26 28.3	02.8	251 51.0	10.1	162 46.2	02.9
A	14	316 02.1	341 18.8	51.5	41 28.7	02.8	266 53.6	10.1	177 48.8	02.9
Y	15	331 04.6	356 18.7	·· 50.4	56 29.1	·· 02.7	281 56.1	·· 10.1	192 51.4	·· 03.0
	16	346 07.0	11 18.5	49.2	71 29.5	02.7	296 58.7	10.0	207 54.1	03.0
	17	1 09.5	26 18.4	48.1	86 29.9	02.6	312 01.2	10.0	222 56.7	03.1
	18	16 12.0	41 18.3	S11 46.9	101 30.3	S24 02.6	327 03.7	N17 10.0	237 59.3	N17 03.1
	19	31 14.4	56 18.2	45.8	116 30.7	02.6	342 06.3	10.0	253 01.9	03.2
	20	46 16.9	71 18.1	44.6	131 31.2	02.5	357 08.8	10.0	268 04.6	03.2
	21	61 19.4	86 18.0	·· 43.5	146 31.6	·· 02.5	12 11.4	·· 10.0	283 07.2	·· 03.3
	22	76 21.8	101 17.8	42.3	161 32.0	02.5	27 13.9	10.0	298 09.8	03.3
	23	91 24.3	116 17.7	41.2	176 32.4	02.4	42 16.5	10.0	313 12.4	03.4
	Mer. Pass.	h m 16 59.3	v −0.1	d 1.1	v 0.4	d 0.0	v 2.6	d 0.0	v 2.6	d 0.1

STARS		
Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 38.9	S40 24.0
Achernar	335 47.1	S57 21.5
Acrux	173 39.8	S62 58.1
Adhara	255 33.7	S28 56.6
Aldebaran	291 20.5	N16 27.8
Alioth	166 44.8	N56 04.7
Alkaid	153 20.6	N49 25.4
Al Na'ir	28 18.4	S47 04.5
Alnilam	276 13.9	S 1 13.1
Alphard	218 22.7	S 8 33.6
Alphecca	126 34.5	N26 47.4
Alpheratz	358 11.9	N28 58.0
Altair	62 35.3	N 8 48.5
Ankaa	353 42.8	S42 26.1
Antares	113 00.2	S26 22.8
Arcturus	146 20.9	N19 18.0
Atria	108 27.1	S68 59.0
Avior	234 28.5	S59 26.2
Bellatrix	279 01.1	N 6 19.6
Betelgeuse	271 30.6	N 7 24.1
Canopus	264 07.7	S52 41.2
Capella	281 14.5	N45 58.5
Deneb	49 50.5	N45 12.1
Denebola	183 01.5	N14 41.8
Diphda	349 23.4	S18 06.9
Dubhe	194 24.9	N61 52.1
Elnath	278 46.9	N28 35.3
Eltanin	90 59.4	N51 29.5
Enif	34 14.3	N 9 46.3
Fomalhaut	15 54.4	S29 44.7
Gacrux	172 31.3	S56 58.9
Gienah	176 20.4	S17 24.8
Hadar	149 27.0	S60 15.5
Hamal	328 31.6	N23 21.3
Kaus Aust.	84 20.5	S34 23.7
Kochab	137 19.6	N74 14.7
Markab	14 05.8	N15 05.0
Menkar	314 43.5	N 3 59.9
Menkent	148 40.0	S36 15.3
Miaplacidus	221 44.5	S69 37.3
Mirfak	309 19.3	N49 47.0
Nunki	76 32.6	S26 19.5
Peacock	54 02.9	S56 48.6
Pollux	244 00.8	N28 04.8
Procyon	245 28.0	N 5 16.9
Rasalhague	96 32.2	N12 34.6
Regulus	208 12.4	N12 04.6
Rigel	281 38.1	S 8 13.8
Rigil Kent.	140 29.4	S60 44.1
Sabik	102 44.3	S15 41.7
Schedar	350 11.8	N56 25.0
Shaula	96 59.5	S37 05.1
Sirius	258 57.5	S16 41.2
Spica	159 00.2	S11 02.5
Suhail	223 12.2	S43 20.4
Vega	80 57.9	N38 45.8
Zuben'ubi	137 35.9	S15 56.7

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	26 55.5	15 15
Mars	86 44.7	11 15
Jupiter	310 48.1	20 15
Saturn	221 40.7	2 15

1977 JANUARY 4, 5, 6 (TUES., WED., THURS.)

G.M.T.		SUN G.H.A.	SUN Dec.	MOON G.H.A.	MOON v	MOON Dec.	MOON d	MOON H.P.
d h		° ′	° ′	° ′	′	° ′	′	′
4 00		178 48.1	S22 45.2	17 23.6	11.0	N19 14.4	0.7	54.9
01		193 47.8	45.0	31 53.6	11.0	19 13.7	0.8	55.0
02		208 47.5	44.7	46 23.6	10.9	19 12.9	1.0	55.0
03		223 47.2	·· 44.4	60 53.5	11.0	19 11.9	1.0	55.0
04		238 46.9	44.2	75 23.5	10.9	19 10.9	1.1	55.0
05		253 46.6	43.9	89 53.4	10.9	19 09.8	1.2	55.0
06		268 46.4	S22 43.7	104 23.3	10.9	N19 08.6	1.3	55.0
07		283 46.1	43.4	118 53.2	10.9	19 07.3	1.4	55.1
08	TUESDAY	298 45.8	43.1	133 23.1	10.9	19 05.9	1.5	55.1
09		313 45.5	·· 42.9	147 53.0	10.9	19 04.4	1.6	55.1
10		328 45.2	42.6	162 22.9	10.9	19 02.8	1.7	55.1
11		343 45.0	42.3	176 52.8	10.8	19 01.1	1.8	55.1
12		358 44.7	S22 42.1	191 22.6	10.9	N18 59.3	1.9	55.1
13		13 44.4	41.8	205 52.5	10.8	18 57.4	2.0	55.2
14		28 44.1	41.5	220 22.3	10.8	18 55.4	2.1	55.2
15		43 43.8	·· 41.3	234 52.1	10.8	18 53.3	2.2	55.2
16		58 43.5	41.0	249 21.9	10.8	18 51.1	2.2	55.2
17		73 43.3	40.7	263 51.7	10.8	18 48.9	2.4	55.2
18		88 43.0	S22 40.5	278 21.5	10.8	N18 46.5	2.5	55.2
19		103 42.7	40.2	292 51.3	10.8	18 44.0	2.5	55.3
20		118 42.4	39.9	307 21.1	10.8	18 41.5	2.7	55.3
21		133 42.1	·· 39.6	321 50.9	10.8	18 38.8	2.7	55.3
22		148 41.9	39.4	336 20.7	10.7	18 36.1	2.9	55.3
23		163 41.6	39.1	350 50.4	10.8	18 33.2	2.9	55.3
5 00		178 41.3	S22 38.8	5 20.2	10.8	N18 30.3	3.0	55.4
01		193 41.0	38.5	19 50.0	10.7	18 27.3	3.2	55.4
02		208 40.7	38.3	34 19.7	10.8	18 24.1	3.2	55.4
03		223 40.5	·· 38.0	48 49.5	10.8	18 20.9	3.3	55.4
04		238 40.2	37.7	63 19.3	10.7	18 17.6	3.4	55.4
05		253 39.9	37.4	77 49.0	10.8	18 14.2	3.5	55.4
06		268 39.6	S22 37.2	92 18.8	10.7	N18 10.7	3.7	55.5
07	WEDNESDAY	283 39.3	36.9	106 48.5	10.8	18 07.0	3.7	55.5
08		298 39.1	36.6	121 18.3	10.7	18 03.3	3.7	55.5
09		313 38.8	·· 36.3	135 48.0	10.8	17 59.6	3.9	55.5
10		328 38.5	36.0	150 17.8	10.8	17 55.7	4.0	55.5
11		343 38.2	35.7	164 47.6	10.7	17 51.7	4.1	55.6
12		358 38.0	S22 35.5	179 17.3	10.8	N17 47.6	4.1	55.6
13		13 37.7	35.2	193 47.1	10.8	17 43.5	4.3	55.6
14		28 37.4	34.9	208 16.9	10.7	17 39.2	4.3	55.6
15		43 37.1	·· 34.6	222 46.6	10.8	17 34.9	4.5	55.6
16		58 36.9	34.3	237 16.4	10.8	17 30.4	4.5	55.7
17		73 36.6	34.0	251 46.2	10.8	17 25.9	4.7	55.7
18		88 36.3	S22 33.7	266 16.0	10.8	N17 21.2	4.7	55.7
19		103 36.0	33.4	280 45.8	10.8	17 16.5	4.8	55.7
20		118 35.7	33.2	295 15.6	10.8	17 11.7	4.9	55.7
21		133 35.5	·· 32.9	309 45.4	10.8	17 06.8	5.0	55.8
22		148 35.2	32.6	324 15.2	10.8	17 01.8	5.0	55.8
23		163 34.9	32.3	338 45.0	10.8	16 56.8	5.2	55.8
6 00		178 34.6	S22 32.0	353 14.8	10.8	N16 51.6	5.3	55.8
01		193 34.4	31.7	7 44.6	10.9	16 46.3	5.3	55.8
02		208 34.1	31.4	22 14.5	10.8	16 41.0	5.4	55.8
03		223 33.8	·· 31.1	36 44.3	10.9	16 35.6	5.6	55.9
04		238 33.5	30.8	51 14.2	10.8	16 30.0	5.6	55.9
05		253 33.3	30.5	65 44.0	10.9	16 24.4	5.7	55.9
06		268 33.0	S22 30.2	80 13.9	10.9	N16 18.7	5.7	55.9
07		283 32.7	29.9	94 43.8	10.9	16 13.0	5.9	55.9
08	THURSDAY	298 32.5	29.6	109 13.7	10.9	16 07.1	6.0	56.0
09		313 32.2	·· 29.3	123 43.6	10.9	16 01.1	6.0	56.0
10		328 31.9	29.0	138 13.5	10.9	15 55.1	6.1	56.0
11		343 31.6	28.7	152 43.4	11.0	15 49.0	6.2	56.0
12		358 31.4	S22 28.4	167 13.4	10.9	N15 42.8	6.3	56.0
13		13 31.1	28.1	181 43.3	11.0	15 36.5	6.4	56.1
14		28 30.8	27.8	196 13.3	10.9	15 30.1	6.5	56.1
15		43 30.5	·· 27.5	210 43.2	11.0	15 23.6	6.5	56.1
16		58 30.3	27.2	225 13.2	11.0	15 17.1	6.6	56.1
17		73 30.0	26.9	239 43.2	11.0	15 10.5	6.7	56.1
18		88 29.7	S22 26.6	254 13.2	11.0	N15 03.8	6.8	56.2
19		103 29.5	26.3	268 43.2	11.1	14 57.0	6.9	56.2
20		118 29.2	25.9	283 13.3	11.0	14 50.1	6.9	56.2
21		133 28.9	·· 25.6	297 43.3	11.1	14 43.2	7.1	56.2
22		148 28.6	25.3	312 13.4	11.0	14 36.1	7.1	56.2
23		163 28.4	25.0	326 43.4	11.1	14 29.0	7.2	56.3
		S.D. 16.3	d 0.3	S.D. 15.0		15.1		15.3

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 4	Moonrise 5	Moonrise 6	Moonrise 7
°	h m	h m	h m	h m	h m	h m	h m
N 72	08 20	10 30	■	☐	12 53	15 09	17 06
N 70	08 02	09 43	■	12 36	14 06	15 46	17 28
68	07 47	09 12	11 30	13 27	14 43	16 11	17 44
66	07 35	08 50	10 20	13 59	15 09	16 31	17 58
64	07 25	08 32	09 45	14 22	15 30	16 47	18 09
62	07 16	08 17	09 20	14 41	15 46	17 00	18 19
60	07 08	08 04	09 00	14 56	16 00	17 11	18 27
N 58	07 01	07 53	08 44	15 09	16 11	17 20	18 34
56	06 55	07 43	08 30	15 20	16 21	17 29	18 40
54	06 49	07 35	08 18	15 30	16 30	17 36	18 46
52	06 44	07 27	08 07	15 39	16 38	17 43	18 51
50	06 39	07 20	07 58	15 47	16 45	17 49	18 55
45	06 28	07 05	07 38	16 03	17 00	18 01	19 05
N 40	06 18	06 52	07 22	16 17	17 13	18 12	19 13
35	06 09	06 41	07 09	16 29	17 24	18 21	19 20
30	06 01	06 31	06 57	16 39	17 33	18 29	19 27
20	05 45	06 12	06 36	16 56	17 49	18 43	19 37
N 10	05 30	05 56	06 19	17 12	18 03	18 55	19 46
0	05 13	05 39	06 02	17 26	18 16	19 06	19 55
S 10	04 55	05 22	05 45	17 40	18 29	19 17	20 04
20	04 33	05 02	05 27	17 55	18 43	19 29	20 13
30	04 05	04 38	05 05	18 13	18 59	19 42	20 24
35	03 47	04 23	04 53	18 23	19 08	19 50	20 30
40	03 25	04 06	04 38	18 35	19 19	19 59	20 36
45	02 56	03 44	04 21	18 48	19 31	20 09	20 44
S 50	02 14	03 16	04 00	19 05	19 46	20 22	20 54
52	01 49	03 02	03 49	19 13	19 53	20 28	20 58
54	01 12	02 45	03 38	19 21	20 01	20 34	21 03
56	////	02 25	03 24	19 31	20 09	20 41	21 08
58	////	01 58	03 09	19 42	20 19	20 49	21 14
S 60	////	01 19	02 50	19 55	20 30	20 58	21 21

Lat.	Sunset	Twilight Civil	Twilight Naut.	Moonset 4	Moonset 5	Moonset 6	Moonset 7
°	h m	h m	h m	h m	h m	h m	h m
N 72	■	13 41	15 52	☐	11 21	10 49	10 35
N 70	■	14 29	16 10	09 53	10 07	10 11	10 12
68	12 42	14 59	16 24	09 02	09 29	09 45	09 54
66	13 51	15 22	16 36	08 30	09 03	09 25	09 39
64	14 26	15 40	16 46	08 06	08 42	09 08	09 27
62	14 52	15 55	16 55	07 47	08 25	08 55	09 17
60	15 11	16 07	17 03	07 32	08 11	08 43	09 08
N 58	15 28	16 18	17 10	07 19	08 00	08 33	09 00
56	15 41	16 28	17 16	07 08	07 49	08 24	08 54
54	15 53	16 36	17 22	06 58	07 40	08 16	08 47
52	16 04	16 44	17 27	06 49	07 32	08 09	08 42
50	16 13	16 51	17 32	06 41	07 24	08 03	08 37
45	16 33	17 06	17 43	06 24	07 09	07 49	08 26
N 40	16 49	17 19	17 53	06 10	06 56	07 38	08 17
35	17 02	17 30	18 02	05 58	06 45	07 28	08 09
30	17 14	17 40	18 10	05 48	06 35	07 20	08 02
20	17 35	17 59	18 26	05 30	06 18	07 05	07 50
N 10	17 52	18 15	18 41	05 15	06 04	06 52	07 39
0	18 09	18 32	18 58	05 00	05 50	06 40	07 30
S 10	18 26	18 49	19 16	04 45	05 36	06 28	07 20
20	18 44	19 09	19 38	04 30	05 21	06 15	07 09
30	19 05	19 33	20 06	04 12	05 05	06 00	06 56
35	19 18	19 47	20 23	04 02	04 55	05 51	06 49
40	19 32	20 05	20 45	03 50	04 43	05 41	06 41
45	19 49	20 26	21 14	03 36	04 30	05 29	06 32
S 50	20 11	20 54	21 56	03 18	04 14	05 15	06 20
52	20 21	21 08	22 21	03 10	04 06	05 08	06 15
54	20 33	21 25	22 56	03 01	03 58	05 01	06 09
56	20 46	21 45	////	02 51	03 48	04 52	06 02
58	21 01	22 11	////	02 39	03 37	04 43	05 55
S 60	21 20	22 49	////	02 26	03 24	04 32	05 46

Day	SUN Eqn. of Time 00ʰ	SUN Eqn. of Time 12ʰ	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
	m s	m s	h m	h m	h m	d	
4	04 47	05 01	12 05	23 38	11 13	14	
5	05 14	05 28	12 05	24 28	12 03	15	○
6	05 41	05 54	12 06	00 28	12 53	16	

1977 JANUARY 7, 8, 9 (FRI., SAT., SUN.)

G.M.T.	ARIES	VENUS −3.9		MARS +1.5		JUPITER −2.2		SATURN +0.2	
	G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
d h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
7 00	106 26.8	131 17.6	S11 40.0	191 32.8	S24 02.4	57 19.0	N17 10.0	328 15.1	N17 03.5
01	121 29.2	146 17.5	38.9	206 33.2	02.3	72 21.5	10.0	343 17.7	03.5
02	136 31.7	161 17.4	37.7	221 33.6	02.3	87 24.1	10.0	358 20.3	03.6
03	151 34.1	176 17.3	·· 36.6	236 34.0	·· 02.2	102 26.6	·· 10.0	13 22.9	·· 03.6
04	166 36.6	191 17.2	35.4	251 34.4	02.2	117 29.2	09.9	28 25.6	03.7
05	181 39.1	206 17.1	34.2	266 34.8	02.2	132 31.7	09.9	43 28.2	03.7
06	196 41.5	221 17.0	S11 33.1	281 35.2	S24 02.1	147 34.2	N17 09.9	58 30.8	N17 03.8
07	211 44.0	236 16.8	31.9	296 35.6	02.1	162 36.8	09.9	73 33.5	03.8
08	226 46.5	251 16.7	30.8	311 36.0	02.0	177 39.3	09.9	88 36.1	03.9
F 09	241 48.9	266 16.6	·· 29.6	326 36.4	·· 02.0	192 41.8	·· 09.9	103 38.7	·· 04.0
R 10	256 51.4	281 16.5	28.5	341 36.9	01.9	207 44.4	09.9	118 41.3	04.0
I 11	271 53.9	296 16.4	27.3	356 37.3	01.9	222 46.9	09.9	133 44.0	04.1
D 12	286 56.3	311 16.3	S11 26.2	11 37.7	S24 01.8	237 49.5	N17 09.9	148 46.6	N17 04.1
A 13	301 58.8	326 16.2	25.0	26 38.1	01.8	252 52.0	09.9	163 49.2	04.2
Y 14	317 01.3	341 16.1	23.8	41 38.5	01.8	267 54.5	09.9	178 51.9	04.2
15	332 03.7	356 16.0	·· 22.7	56 38.9	·· 01.7	282 57.1	·· 09.9	193 54.5	·· 04.3
16	347 06.2	11 15.9	21.5	71 39.3	01.7	297 59.6	09.9	208 57.1	04.3
17	2 08.6	26 15.8	20.4	86 39.7	01.6	313 02.1	09.9	223 59.7	04.4
18	17 11.1	41 15.7	S11 19.2	101 40.1	S24 01.6	328 04.7	N17 09.9	239 02.4	N17 04.5
19	32 13.6	56 15.6	18.0	116 40.5	01.5	343 07.2	09.8	254 05.0	04.5
20	47 16.0	71 15.5	16.9	131 40.9	01.5	358 09.7	09.8	269 07.6	04.6
21	62 18.5	86 15.4	·· 15.7	146 41.3	·· 01.4	13 12.3	·· 09.8	284 10.3	·· 04.6
22	77 21.0	101 15.3	14.6	161 41.7	01.4	28 14.8	09.8	299 12.9	04.7
23	92 23.4	116 15.2	13.4	176 42.1	01.3	43 17.3	09.8	314 15.5	04.7
8 00	107 25.9	131 15.1	S11 12.2	191 42.5	S24 01.3	58 19.9	N17 09.8	329 18.1	N17 04.8
01	122 28.4	146 15.0	11.1	206 42.9	01.2	73 22.4	09.8	344 20.8	04.8
02	137 30.8	161 15.0	09.9	221 43.4	01.1	88 24.9	09.8	359 23.4	04.9
03	152 33.3	176 14.9	·· 08.8	236 43.8	·· 01.1	103 27.5	·· 09.8	14 26.0	·· 05.0
04	167 35.7	191 14.8	07.6	251 44.2	01.0	118 30.0	09.8	29 28.7	05.0
05	182 38.2	206 14.7	06.4	266 44.6	01.0	133 32.5	09.8	44 31.3	05.1
06	197 40.7	221 14.6	S11 05.3	281 45.0	S24 00.9	148 35.1	N17 09.8	59 33.9	N17 05.1
07	212 43.1	236 14.5	04.1	296 45.4	00.9	163 37.6	09.8	74 36.6	05.2
S 08	227 45.6	251 14.4	02.9	311 45.8	00.8	178 40.1	09.8	89 39.2	05.2
A 09	242 48.1	266 14.3	·· 01.8	326 46.2	·· 00.8	193 42.6	·· 09.8	104 41.8	·· 05.3
T 10	257 50.5	281 14.3	11 00.6	341 46.6	00.7	208 45.2	09.8	119 44.4	05.3
U 11	272 53.0	296 14.2	10 59.4	356 47.0	00.7	223 47.7	09.8	134 47.1	05.4
R 12	287 55.5	311 14.1	S10 58.3	11 47.4	S24 00.6	238 50.2	N17 09.8	149 49.7	N17 05.5
D 13	302 57.9	326 14.0	57.1	26 47.8	00.5	253 52.8	09.8	164 52.3	05.5
A 14	318 00.4	341 13.9	55.9	41 48.2	00.5	268 55.3	09.8	179 55.0	05.6
Y 15	333 02.9	356 13.8	·· 54.8	56 48.6	·· 00.4	283 57.8	·· 09.7	194 57.6	·· 05.6
16	348 05.3	11 13.8	53.6	71 49.0	00.4	299 00.3	09.7	210 00.2	05.7
17	3 07.8	26 13.7	52.4	86 49.4	00.3	314 02.9	09.7	225 02.9	05.7
18	18 10.2	41 13.6	S10 51.3	101 49.8	S24 00.2	329 05.4	N17 09.7	240 05.5	N17 05.8
19	33 12.7	56 13.5	50.1	116 50.2	00.2	344 07.9	09.7	255 08.1	05.8
20	48 15.2	71 13.4	48.9	131 50.7	00.1	359 10.4	09.7	270 10.8	05.9
21	63 17.6	86 13.4	·· 47.8	146 51.1	·· 00.1	14 13.0	·· 09.7	285 13.4	·· 06.0
22	78 20.1	101 13.3	46.6	161 51.5	24 00.0	29 15.5	09.7	300 16.0	06.0
23	93 22.6	116 13.2	45.4	176 51.9	23 59.9	44 18.0	09.7	315 18.7	06.1
9 00	108 25.0	131 13.1	S10 44.2	191 52.3	S23 59.9	59 20.5	N17 09.7	330 21.3	N17 06.1
01	123 27.5	146 13.1	43.1	206 52.7	59.8	74 23.1	09.7	345 23.9	06.2
02	138 30.0	161 13.0	41.9	221 53.1	59.7	89 25.6	09.7	0 26.6	06.2
03	153 32.4	176 12.9	·· 40.7	236 53.5	·· 59.7	104 28.1	·· 09.7	15 29.2	·· 06.3
04	168 34.9	191 12.8	39.6	251 53.9	59.6	119 30.6	09.7	30 31.8	06.4
05	183 37.4	206 12.8	38.4	266 54.3	59.6	134 33.2	09.7	45 34.5	06.4
06	198 39.8	221 12.7	S10 37.2	281 54.7	S23 59.5	149 35.7	N17 09.7	60 37.1	N17 06.5
07	213 42.3	236 12.6	36.0	296 55.1	59.4	164 38.2	09.7	75 39.7	06.5
08	228 44.7	251 12.6	34.9	311 55.5	59.4	179 40.7	09.7	90 42.4	06.6
S 09	243 47.2	266 12.5	·· 33.7	326 55.9	·· 59.3	194 43.2	·· 09.7	105 45.0	·· 06.6
U 10	258 49.7	281 12.4	32.5	341 56.3	59.2	209 45.8	09.7	120 47.6	06.7
N 11	273 52.1	296 12.4	31.3	356 56.7	59.2	224 48.3	09.7	135 50.3	06.7
D 12	288 54.6	311 12.3	S10 30.2	11 57.1	S23 59.1	239 50.8	N17 09.7	150 52.9	N17 06.8
A 13	303 57.1	326 12.2	29.0	26 57.5	59.0	254 53.3	09.7	165 55.5	06.9
Y 14	318 59.5	341 12.2	27.8	41 57.9	59.0	269 55.8	09.7	180 58.2	06.9
15	334 02.0	356 12.1	·· 26.6	56 58.3	·· 58.9	284 58.4	·· 09.7	196 00.8	·· 07.0
16	349 04.5	11 12.1	25.5	71 58.7	58.8	300 00.9	09.7	211 03.4	07.0
17	4 06.9	26 12.0	24.3	86 59.1	58.7	315 03.4	09.7	226 06.1	07.1
18	19 09.4	41 11.9	S10 23.1	101 59.6	S23 58.7	330 05.9	N17 09.7	241 08.7	N17 07.1
19	34 11.8	56 11.9	21.9	117 00.0	58.6	345 08.4	09.7	256 11.3	07.2
20	49 14.3	71 11.8	20.8	132 00.4	58.5	0 10.9	09.7	271 14.0	07.3
21	64 16.8	86 11.8	·· 19.6	147 00.8	·· 58.5	15 13.5	·· 09.7	286 16.6	·· 07.3
22	79 19.2	101 11.7	18.4	162 01.2	58.4	30 16.0	09.7	301 19.2	07.4
23	94 21.7	116 11.6	17.2	177 01.6	58.3	45 18.5	09.7	316 21.9	07.4
Mer. Pass.	h m 16 47.5	*v* −0.1	*d* 1.2	*v* 0.4	*d* 0.1	*v* 2.5	*d* 0.0	*v* 2.6	*d* 0.1

STARS		
Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 38.9	S40 24.1
Achernar	335 47.1	S57 21.5
Acrux	173 39.7	S62 58.1
Adhara	255 33.7	S28 56.6
Aldebaran	291 20.5	N16 27.8
Alioth	166 44.7	N56 04.7
Alkaid	153 20.6	N49 25.4
Al Na'ir	28 18.4	S47 04.5
Alnilam	276 13.9	S 1 13.1
Alphard	218 22.7	S 8 33.7
Alphecca	126 34.4	N26 47.4
Alpheratz	358 11.9	N28 58.0
Altair	62 35.3	N 8 48.5
Ankaa	353 42.8	S42 26.1
Antares	113 00.2	S26 22.8
Arcturus	146 20.8	N19 18.0
Atria	108 27.1	S68 59.0
Avior	234 28.5	S59 26.2
Bellatrix	279 01.1	N 6 19.6
Betelgeuse	271 30.6	N 7 24.1
Canopus	264 07.7	S52 41.2
Capella	281 14.5	N45 58.5
Deneb	49 50.5	N45 12.1
Denebola	183 01.5	N14 41.8
Diphda	349 23.4	S18 06.9
Dubhe	194 24.9	N61 52.1
Elnath	278 46.9	N28 35.3
Eltanin	90 59.4	N51 29.5
Enif	34 14.3	N 9 46.3
Fomalhaut	15 54.4	S29 44.7
Gacrux	172 31.3	S56 58.9
Gienah	176 20.4	S17 24.9
Hadar	149 26.9	S60 15.5
Hamal	328 31.6	N23 21.3
Kaus Aust.	84 20.5	S34 23.7
Kochab	137 19.6	N74 14.7
Markab	14 05.8	N15 05.0
Menkar	314 43.5	N 3 59.9
Menkent	148 40.0	S36 15.3
Miaplacidus	221 44.5	S69 37.3
Mirfak	309 19.3	N49 47.0
Nunki	76 32.6	S26 19.5
Peacock	54 02.9	S56 48.6
Pollux	244 00.8	N28 04.8
Procyon	245 28.0	N 5 16.9
Rasalhague	96 32.2	N12 34.6
Regulus	208 12.4	N12 04.6
Rigel	281 38.1	S 8 13.8
Rigil Kent.	140 29.3	S60 44.1
Sabik	102 44.3	S15 41.7
Schedar	350 11.8	N56 25.0
Shaula	96 59.5	S37 05.1
Sirius	258 57.5	S16 41.3
Spica	159 00.2	S11 02.5
Suhail	223 12.2	S43 20.4
Vega	80 57.9	N38 45.8
Zuben'ubi	137 35.9	S15 56.7

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	23 49.3	15 15
Mars	84 16.7	11 13
Jupiter	310 54.0	20 03
Saturn	221 52.3	2 02

	G.M.T.	SUN G.H.A.	SUN Dec.	MOON G.H.A.	MOON *v*	MOON Dec.	MOON *d*	MOON H.P.
	d h	° ′	° ′	° ′	′	° ′	′	′
	7 00	178 28.1	S22 24.7	341 13.5	11.1	N14 21.8	7.2	56.3
	01	193 27.8	24.4	355 43.6	11.1	14 14.6	7.4	56.3
	02	208 27.6	24.1	10 13.7	11.2	14 07.2	7.4	56.3
	03	223 27.3	·· 23.8	24 43.9	11.1	13 59.8	7.5	56.3
	04	238 27.0	23.4	39 14.0	11.1	13 52.3	7.5	56.4
	05	253 26.8	23.1	53 44.1	11.2	13 44.8	7.7	56.4
	06	268 26.5	S22 22.8	68 14.3	11.2	N13 37.1	7.7	56.4
	07	283 26.2	22.5	82 44.5	11.2	13 29.4	7.8	56.4
	08	298 25.9	22.2	97 14.7	11.2	13 21.6	7.8	56.4
F	09	313 25.7	·· 21.8	111 44.9	11.2	13 13.8	8.0	56.5
R	10	328 25.4	21.5	126 15.1	11.2	13 05.8	8.0	56.5
I	11	343 25.1	21.2	140 45.3	11.3	12 57.8	8.0	56.5
D	12	358 24.9	S22 20.9	155 15.6	11.2	N12 49.8	8.2	56.5
A	13	13 24.6	20.6	169 45.8	11.3	12 41.6	8.2	56.5
Y	14	28 24.3	20.2	184 16.1	11.3	12 33.4	8.3	56.6
	15	43 24.1	·· 19.9	198 46.4	11.3	12 25.1	8.3	56.6
	16	58 23.8	19.6	213 16.7	11.3	12 16.8	8.5	56.6
	17	73 23.5	19.3	227 47.0	11.3	12 08.3	8.4	56.6
	18	88 23.3	S22 18.9	242 17.3	11.4	N11 59.9	8.6	56.6
	19	103 23.0	18.6	256 47.7	11.3	11 51.3	8.6	56.7
	20	118 22.7	18.3	271 18.0	11.4	11 42.7	8.7	56.7
	21	133 22.5	·· 18.0	285 48.4	11.4	11 34.0	8.7	56.7
	22	148 22.2	17.6	300 18.8	11.4	11 25.3	8.9	56.7
	23	163 21.9	17.3	314 49.2	11.4	11 16.4	8.8	56.7
	8 00	178 21.7	S22 17.0	329 19.6	11.4	N11 07.6	9.0	56.8
	01	193 21.4	16.6	343 50.0	11.4	10 58.6	9.0	56.8
	02	208 21.1	16.3	358 20.4	11.5	10 49.6	9.0	56.8
	03	223 20.9	·· 16.0	12 50.9	11.4	10 40.6	9.1	56.8
	04	238 20.6	15.6	27 21.3	11.5	10 31.5	9.2	56.8
	05	253 20.4	15.3	41 51.8	11.5	10 22.3	9.2	56.9
	06	268 20.1	S22 15.0	56 22.3	11.4	N10 13.1	9.3	56.9
	07	283 19.8	14.6	70 52.7	11.5	10 03.8	9.4	56.9
S	08	298 19.6	14.3	85 23.2	11.5	9 54.4	9.4	56.9
A	09	313 19.3	·· 14.0	99 53.7	11.6	9 45.0	9.4	56.9
T	10	328 19.0	13.6	114 24.3	11.5	9 35.6	9.5	57.0
U	11	343 18.8	13.3	128 54.8	11.5	9 26.1	9.6	57.0
R	12	358 18.5	S22 12.9	143 25.3	11.6	N 9 16.5	9.6	57.0
D	13	13 18.2	12.6	157 55.9	11.5	9 06.9	9.7	57.0
A	14	28 18.0	12.3	172 26.4	11.6	8 57.2	9.7	57.0
Y	15	43 17.7	·· 11.9	186 57.0	11.6	8 47.5	9.8	57.1
	16	58 17.5	11.6	201 27.6	11.5	8 37.7	9.8	57.1
	17	73 17.2	11.2	215 58.1	11.6	8 27.9	9.9	57.1
	18	88 16.9	S22 10.9	230 28.7	11.6	N 8 18.0	9.9	57.1
	19	103 16.7	10.5	244 59.3	11.6	8 08.1	9.9	57.1
	20	118 16.4	10.2	259 29.9	11.6	7 58.2	10.1	57.2
	21	133 16.2	·· 09.8	274 00.5	11.6	7 48.1	10.0	57.2
	22	148 15.9	09.5	288 31.1	11.6	7 38.1	10.1	57.2
	23	163 15.6	09.2	303 01.7	11.7	7 28.0	10.2	57.2
	9 00	178 15.4	S22 08.8	317 32.4	11.6	N 7 17.8	10.1	57.2
	01	193 15.1	08.5	332 03.0	11.6	7 07.7	10.3	57.3
	02	208 14.9	08.1	346 33.6	11.7	6 57.4	10.2	57.3
	03	223 14.6	·· 07.8	1 04.3	11.6	6 47.2	10.4	57.3
	04	238 14.3	07.4	15 34.9	11.6	6 36.8	10.3	57.3
	05	253 14.1	07.0	30 05.5	11.7	6 26.5	10.4	57.3
	06	268 13.8	S22 06.7	44 36.2	11.6	N 6 16.1	10.4	57.4
	07	283 13.6	06.3	59 06.8	11.7	6 05.7	10.5	57.4
	08	298 13.3	06.0	73 37.5	11.6	5 55.2	10.5	57.4
S	09	313 13.0	·· 05.6	88 08.1	11.7	5 44.7	10.5	57.4
U	10	328 12.8	05.3	102 38.8	11.6	5 34.2	10.6	57.4
N	11	343 12.5	04.9	117 09.4	11.7	5 23.6	10.6	57.5
D	12	358 12.3	S22 04.6	131 40.1	11.6	N 5 13.0	10.6	57.5
A	13	13 12.0	04.2	146 10.7	11.6	5 02.4	10.7	57.5
Y	14	28 11.8	03.8	160 41.3	11.7	4 51.7	10.7	57.5
	15	43 11.5	·· 03.5	175 12.0	11.6	4 41.0	10.7	57.5
	16	58 11.2	03.1	189 42.6	11.7	4 30.3	10.8	57.6
	17	73 11.0	02.8	204 13.3	11.6	4 19.5	10.8	57.6
	18	88 10.7	S22 02.4	218 43.9	11.6	N 4 08.7	10.8	57.6
	19	103 10.5	02.0	233 14.5	11.6	3 57.9	10.8	57.6
	20	118 10.2	01.7	247 45.1	11.6	3 47.1	10.9	57.6
	21	133 10.0	·· 01.3	262 15.7	11.7	3 36.2	10.9	57.7
	22	148 09.7	00.9	276 46.4	11.6	3 25.3	10.9	57.7
	23	163 09.5	00.6	291 17.0	11.5	3 14.4	11.0	57.7
		S.D. 16.3	*d* 0.3	S.D. 15.4		15.5		15.7

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 7	Moonrise 8	Moonrise 9	Moonrise 10
°	h m	h m	h m	h m	h m	h m	h m
N 72	08 15	10 19	■	17 06	18 57	20 47	22 37
N 70	07 58	09 36	■	17 28	19 10	20 52	22 35
68	07 44	09 08	11 10	17 44	19 20	20 56	22 34
66	07 33	08 46	10 13	17 58	19 28	21 00	22 33
64	07 23	08 29	09 40	18 09	19 35	21 03	22 32
62	07 14	08 14	09 16	18 19	19 41	21 05	22 31
60	07 07	08 02	08 57	18 27	19 46	21 07	22 30
N 58	07 00	07 51	08 41	18 34	19 51	21 09	22 29
56	06 54	07 42	08 28	18 40	19 55	21 11	22 29
54	06 48	07 34	08 16	18 46	19 58	21 13	22 28
52	06 43	07 26	08 06	18 51	20 02	21 14	22 28
50	06 38	07 19	07 57	18 55	20 05	21 15	22 27
45	06 28	07 04	07 38	19 05	20 11	21 18	22 26
N 40	06 18	06 52	07 22	19 13	20 16	21 20	22 25
35	06 09	06 41	07 09	19 20	20 21	21 22	22 25
30	06 01	06 31	06 57	19 27	20 25	21 24	22 24
20	05 46	06 13	06 37	19 37	20 32	21 27	22 23
N 10	05 31	05 57	06 20	19 46	20 38	21 30	22 22
0	05 15	05 41	06 03	19 55	20 44	21 33	22 21
S 10	04 57	05 24	05 46	20 04	20 50	21 35	22 21
20	04 35	05 04	05 29	20 13	20 56	21 38	22 20
30	04 08	04 41	05 08	20 24	21 03	21 41	22 19
35	03 50	04 26	04 55	20 30	21 07	21 43	22 18
40	03 28	04 09	04 41	20 36	21 11	21 45	22 18
45	03 00	03 48	04 24	20 44	21 17	21 47	22 17
S 50	02 19	03 20	04 03	20 54	21 23	21 50	22 16
52	01 56	03 06	03 53	20 58	21 26	21 51	22 16
54	01 22	02 50	03 42	21 03	21 29	21 53	22 16
56	////	02 31	03 29	21 08	21 32	21 54	22 15
58	////	02 05	03 14	21 14	21 36	21 56	22 15
S 60	////	01 29	02 55	21 21	21 40	21 58	22 14

Lat.	Sunset	Twilight Civil	Twilight Naut.	Moonset 7	Moonset 8	Moonset 9	Moonset 10
°	h m	h m	h m	h m	h m	h m	h m
N 72	■	13 55	15 59	10 35	10 26	10 17	10 10
N 70	■	14 38	16 16	10 12	10 11	10 10	10 08
68	13 04	15 06	16 30	09 54	10 00	10 04	10 07
66	14 01	15 28	16 41	09 39	09 50	09 59	10 06
64	14 34	15 45	16 51	09 27	09 42	09 54	10 05
62	14 58	16 00	17 00	09 17	09 35	09 50	10 05
60	15 17	16 12	17 07	09 08	09 29	09 47	10 04
N 58	15 33	16 22	17 14	09 00	09 24	09 44	10 03
56	15 46	16 32	17 20	08 54	09 19	09 41	10 03
54	15 58	16 40	17 26	08 47	09 15	09 39	10 02
52	16 08	16 48	17 31	08 42	09 11	09 37	10 02
50	16 17	16 55	17 35	08 37	09 07	09 35	10 01
45	16 36	17 09	17 46	08 26	08 59	09 30	10 01
N 40	16 52	17 22	17 56	08 17	08 53	09 27	10 00
35	17 05	17 33	18 04	08 09	08 47	09 24	09 59
30	17 17	17 43	18 12	08 02	08 42	09 21	09 59
20	17 37	18 00	18 28	07 50	08 33	09 16	09 58
N 10	17 54	18 17	18 43	07 39	08 26	09 11	09 57
0	18 10	18 33	18 59	07 30	08 19	09 07	09 56
S 10	18 27	18 50	19 17	07 20	08 11	09 03	09 55
20	18 45	19 09	19 38	07 09	08 03	08 58	09 54
30	19 06	19 33	20 05	06 56	07 55	08 53	09 53
35	19 18	19 47	20 23	06 49	07 49	08 50	09 52
40	19 32	20 04	20 45	06 41	07 43	08 47	09 51
45	19 49	20 25	21 13	06 32	07 36	08 43	09 50
S 50	20 10	20 52	21 53	06 20	07 28	08 38	09 49
52	20 20	21 06	22 16	06 15	07 24	08 36	09 49
54	20 31	21 22	22 49	06 09	07 20	08 33	09 48
56	20 44	21 42	////	06 02	07 15	08 31	09 48
58	20 59	22 06	////	05 55	07 10	08 28	09 47
S 60	21 17	22 41	////	05 46	07 04	08 24	09 46

Day	SUN Eqn. of Time 00ʰ	SUN Eqn. of Time 12ʰ	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
	m s	m s	h m	h m	h m	d	
7	06 07	06 20	12 06	01 18	13 42	17	◑
8	06 33	06 45	12 07	02 07	14 31	18	
9	06 58	07 10	12 07	02 56	15 20	19	

	G.M.T.	ARIES	VENUS −3.9		MARS +1.5		JUPITER −2.2		SATURN +0.2	
		G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
	d h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
	10 00	109 24.2	131 11.6	S10 16.1	192 02.0	S23 58.2	60 21.0	N17 09.7	331 24.5	N17 07.5
	01	124 26.6	146 11.5	14.9	207 02.4	58.2	75 23.5	09.7	346 27.1	07.5
	02	139 29.1	161 11.5	13.7	222 02.8	58.1	90 26.0	09.7	1 29.8	07.6
	03	154 31.6	176 11.4	·· 12.5	237 03.2	·· 58.0	105 28.5	·· 09.7	16 32.4	·· 07.7
	04	169 34.0	191 11.4	11.3	252 03.6	57.9	120 31.1	09.7	31 35.0	07.7
	05	184 36.5	206 11.3	10.2	267 04.0	57.9	135 33.6	09.7	46 37.7	07.8
	06	199 39.0	221 11.3	S10 09.0	282 04.4	S23 57.8	150 36.1	N17 09.7	61 40.3	N17 07.8
	07	214 41.4	236 11.2	07.8	297 04.8	57.7	165 38.6	09.7	76 42.9	07.9
	08	229 43.9	251 11.2	06.6	312 05.2	57.6	180 41.1	09.7	91 45.6	07.9
M	09	244 46.3	266 11.1	·· 05.4	327 05.6	·· 57.6	195 43.6	·· 09.7	106 48.2	·· 08.0
O	10	259 48.8	281 11.1	04.2	342 06.0	57.5	210 46.1	09.7	121 50.9	08.1
N	11	274 51.3	296 11.0	03.1	357 06.4	57.4	225 48.6	09.7	136 53.5	08.1
D	12	289 53.7	311 11.0	S10 01.9	12 06.8	S23 57.3	240 51.2	N17 09.7	151 56.1	N17 08.2
A	13	304 56.2	326 10.9	10 00.7	27 07.2	57.2	255 53.7	09.7	166 58.8	08.2
Y	14	319 58.7	341 10.9	9 59.5	42 07.6	57.2	270 56.2	09.7	182 01.4	08.3
	15	335 01.1	356 10.9	·· 58.3	57 08.0	·· 57.1	285 58.7	·· 09.7	197 04.0	·· 08.3
	16	350 03.6	11 10.8	57.1	72 08.4	57.0	301 01.2	09.7	212 06.7	08.4
	17	5 06.1	26 10.8	56.0	87 08.8	56.9	316 03.7	09.7	227 09.3	08.5
	18	20 08.5	41 10.7	S 9 54.8	102 09.2	S23 56.8	331 06.2	N17 09.7	242 12.0	N17 08.5
	19	35 11.0	56 10.7	53.6	117 09.6	56.8	346 08.7	09.7	257 14.6	08.6
	20	50 13.5	71 10.7	52.4	132 10.0	56.7	1 11.2	09.7	272 17.2	08.6
	21	65 15.9	86 10.6	·· 51.2	147 10.4	·· 56.6	16 13.7	·· 09.7	287 19.9	·· 08.7
	22	80 18.4	101 10.6	50.0	162 10.8	56.5	31 16.2	09.7	302 22.5	08.7
	23	95 20.8	116 10.5	48.9	177 11.3	56.4	46 18.7	09.7	317 25.1	08.8
	11 00	110 23.3	131 10.5	S 9 47.7	192 11.7	S23 56.3	61 21.3	N17 09.7	332 27.8	N17 08.9
	01	125 25.8	146 10.5	46.5	207 12.1	56.3	76 23.8	09.7	347 30.4	08.9
	02	140 28.2	161 10.4	45.3	222 12.5	56.2	91 26.3	09.7	2 33.1	09.0
	03	155 30.7	176 10.4	·· 44.1	237 12.9	·· 56.1	106 28.8	·· 09.7	17 35.7	·· 09.0
	04	170 33.2	191 10.4	42.9	252 13.3	56.0	121 31.3	09.7	32 38.3	09.1
	05	185 35.6	206 10.3	41.7	267 13.7	55.9	136 33.8	09.7	47 41.0	09.2
	06	200 38.1	221 10.3	S 9 40.5	282 14.1	S23 55.8	151 36.3	N17 09.7	62 43.6	N17 09.2
	07	215 40.6	236 10.3	39.4	297 14.5	55.7	166 38.8	09.7	77 46.2	09.3
T	08	230 43.0	251 10.2	38.2	312 14.9	55.6	181 41.3	09.7	92 48.9	09.3
U	09	245 45.5	266 10.2	·· 37.0	327 15.3	·· 55.6	196 43.8	·· 09.7	107 51.5	·· 09.4
E	10	260 47.9	281 10.2	35.8	342 15.7	55.5	211 46.3	09.7	122 54.2	09.4
S	11	275 50.4	296 10.2	34.6	357 16.1	55.4	226 48.8	09.7	137 56.8	09.5
D	12	290 52.9	311 10.1	S 9 33.4	12 16.5	S23 55.3	241 51.3	N17 09.7	152 59.4	N17 09.6
A	13	305 55.3	326 10.1	32.2	27 16.9	55.2	256 53.8	09.7	168 02.1	09.6
Y	14	320 57.8	341 10.1	31.0	42 17.3	55.1	271 56.3	09.7	183 04.7	09.7
	15	336 00.3	356 10.1	·· 29.8	57 17.7	·· 55.0	286 58.8	·· 09.7	198 07.4	·· 09.7
	16	351 02.7	11 10.0	28.6	72 18.1	54.9	302 01.3	09.7	213 10.0	09.8
	17	6 05.2	26 10.0	27.4	87 18.5	54.8	317 03.8	09.7	228 12.6	09.8
	18	21 07.7	41 10.0	S 9 26.3	102 18.9	S23 54.7	332 06.3	N17 09.7	243 15.3	N17 09.9
	19	36 10.1	56 10.0	25.1	117 19.3	54.6	347 08.8	09.7	258 17.9	10.0
	20	51 12.6	71 09.9	23.9	132 19.7	54.6	2 11.3	09.7	273 20.6	10.0
	21	66 15.1	86 09.9	·· 22.7	147 20.1	·· 54.5	17 13.8	·· 09.7	288 23.2	·· 10.1
	22	81 17.5	101 09.9	21.5	162 20.5	54.4	32 16.3	09.7	303 25.8	10.1
	23	96 20.0	116 09.9	20.3	177 20.9	54.3	47 18.8	09.7	318 28.5	10.2
	12 00	111 22.4	131 09.9	S 9 19.1	192 21.3	S23 54.2	62 21.3	N17 09.7	333 31.1	N17 10.3
	01	126 24.9	146 09.9	17.9	207 21.7	54.1	77 23.8	09.7	348 33.8	10.3
	02	141 27.4	161 09.8	16.7	222 22.1	54.0	92 26.3	09.7	3 36.4	10.4
	03	156 29.8	176 09.8	·· 15.5	237 22.5	·· 53.9	107 28.8	·· 09.7	18 39.0	·· 10.4
	04	171 32.3	191 09.8	14.3	252 22.9	53.8	122 31.3	09.7	33 41.7	10.5
	05	186 34.8	206 09.8	13.1	267 23.3	53.7	137 33.8	09.7	48 44.3	10.5
	06	201 37.2	221 09.8	S 9 11.9	282 23.7	S23 53.6	152 36.3	N17 09.7	63 47.0	N17 10.6
W	07	216 39.7	236 09.8	10.7	297 24.1	53.5	167 38.8	09.7	78 49.6	10.7
E	08	231 42.2	251 09.8	09.5	312 24.5	53.4	182 41.3	09.8	93 52.2	10.7
D	09	246 44.6	266 09.8	·· 08.3	327 24.9	·· 53.3	197 43.8	·· 09.8	108 54.9	·· 10.8
N	10	261 47.1	281 09.7	07.1	342 25.3	53.2	212 46.2	09.8	123 57.5	10.8
E	11	276 49.6	296 09.7	06.0	357 25.7	53.1	227 48.7	09.8	139 00.2	10.9
S	12	291 52.0	311 09.7	S 9 04.8	12 26.1	S23 53.0	242 51.2	N17 09.8	154 02.8	N17 11.0
D	13	306 54.5	326 09.7	03.6	27 26.5	52.9	257 53.7	09.8	169 05.4	11.0
A	14	321 56.9	341 09.7	02.4	42 26.9	52.8	272 56.2	09.8	184 08.1	11.1
Y	15	336 59.4	356 09.7	·· 01.2	57 27.3	·· 52.7	287 58.7	·· 09.8	199 10.7	·· 11.1
	16	352 01.9	11 09.7	9 00.0	72 27.7	52.6	303 01.2	09.8	214 13.4	11.2
	17	7 04.3	26 09.7	8 58.8	87 28.1	52.5	318 03.7	09.8	229 16.0	11.2
	18	22 06.8	41 09.7	S 8 57.6	102 28.5	S23 52.4	333 06.2	N17 09.8	244 18.7	N17 11.3
	19	37 09.3	56 09.7	56.4	117 28.9	52.3	348 08.7	09.8	259 21.3	11.4
	20	52 11.7	71 09.7	55.2	132 29.4	52.2	3 11.2	09.8	274 23.9	11.4
	21	67 14.2	86 09.7	·· 54.0	147 29.8	·· 52.1	18 13.7	·· 09.8	289 26.6	·· 11.5
	22	82 16.7	101 09.7	52.8	162 30.2	52.0	33 16.1	09.8	304 29.2	11.5
	23	97 19.1	116 09.7	51.6	177 30.6	51.9	48 18.6	09.8	319 31.9	11.6
	Mer. Pass.	h m 16 35.7	v 0.0	d 1.2	v 0.4	d 0.1	v 2.5	d 0.0	v 2.6	d 0.1

STARS		
Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 39.0	S40 24.1
Achernar	335 47.1	S57 21.5
Acrux	173 39.7	S62 58.1
Adhara	255 33.7	S28 56.6
Aldebaran	291 20.6	N16 27.8
Alioth	166 44.7	N56 04.7
Alkaid	153 20.6	N49 25.4
Al Na'ir	28 18.5	S47 04.5
Alnilam	276 13.9	S 1 13.1
Alphard	218 22.7	S 8 33.7
Alphecca	126 34.4	N26 47.4
Alpheratz	358 12.0	N28 58.0
Altair	62 35.3	N 8 48.5
Ankaa	353 42.8	S42 26.1
Antares	113 00.1	S26 22.8
Arcturus	146 20.8	N19 18.0
Atria	108 27.0	S68 59.0
Avior	234 28.5	S59 26.2
Bellatrix	279 01.1	N 6 19.6
Betelgeuse	271 30.6	N 7 24.1
Canopus	264 07.7	S52 41.2
Capella	281 14.5	N45 58.5
Deneb	49 50.6	N45 12.1
Denebola	183 01.4	N14 41.8
Diphda	349 23.4	S18 06.9
Dubhe	194 24.9	N61 52.1
Elnath	278 46.9	N28 35.3
Eltanin	90 59.4	N51 29.5
Enif	34 14.3	N 9 46.3
Fomalhaut	15 54.4	S29 44.7
Gacrux	172 31.3	S56 58.9
Gienah	176 20.4	S17 24.9
Hadar	149 26.9	S60 15.5
Hamal	328 31.6	N23 21.3
Kaus Aust.	84 20.5	S34 23.7
Kochab	137 19.5	N74 14.7
Markab	14 05.8	N15 05.0
Menkar	314 43.6	N 3 59.9
Menkent	148 40.0	S36 15.3
Miaplacidus	221 44.5	S69 37.4
Mirfak	309 19.3	N49 47.0
Nunki	76 32.6	S26 19.5
Peacock	54 02.9	S56 48.6
Pollux	244 00.8	N28 04.8
Procyon	245 28.0	N 5 16.9
Rasalhague	96 32.2	N12 34.6
Regulus	208 12.4	N12 04.6
Rigel	281 38.1	S 8 13.8
Rigil Kent.	140 29.3	S60 44.1
Sabik	102 44.3	S15 41.7
Schedar	350 11.8	N56 25.0
Shaula	96 59.5	S37 05.1
Sirius	258 57.5	S16 41.3
Spica	159 00.1	S11 02.5
Suhail	223 12.1	S43 20.4
Vega	80 57.9	N38 45.8
Zuben'ubi	137 35.9	S15 56.7

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	20 47.2	15 15
Mars	81 48.3	11 11
Jupiter	310 57.9	19 51
Saturn	222 04.5	1 50

G.M.T.	SUN G.H.A.	SUN Dec.	MOON G.H.A.	MOON v	MOON Dec.	MOON d	MOON H.P.
d h	° ′	° ′	° ′	′	° ′	′	′
10 00	178 09.2	S22 00.2	305 47.5	11.6	N 3 03.4	10.9	57.7
01	193 08.9	21 59.8	320 18.1	11.6	2 52.5	11.0	57.7
02	208 08.7	59.5	334 48.7	11.6	2 41.5	11.0	57.8
03	223 08.4	·· 59.1	349 19.3	11.5	2 30.5	11.0	57.8
04	238 08.2	58.7	3 49.8	11.6	2 19.5	11.1	57.8
05	253 07.9	58.4	18 20.4	11.5	2 08.4	11.0	57.8
06	268 07.7	S21 58.0	32 50.9	11.5	N 1 57.4	11.1	57.8
07	283 07.4	57.6	47 21.4	11.5	1 46.3	11.1	57.9
08	298 07.2	57.2	61 51.9	11.5	1 35.2	11.1	57.9
M 09	313 06.9	·· 56.9	76 22.4	11.5	1 24.1	11.1	57.9
O 10	328 06.7	56.5	90 52.9	11.5	1 13.0	11.1	57.9
N 11	343 06.4	56.1	105 23.4	11.4	1 01.9	11.2	57.9
D 12	358 06.2	S21 55.7	119 53.8	11.5	N 0 50.7	11.1	57.9
A 13	13 05.9	55.4	134 24.3	11.4	0 39.6	11.2	58.0
Y 14	28 05.7	55.0	148 54.7	11.4	0 28.4	11.2	58.0
15	43 05.4	·· 54.6	163 25.1	11.4	0 17.2	11.1	58.0
16	58 05.2	54.2	177 55.5	11.3	N 0 06.1	11.2	58.0
17	73 04.9	53.8	192 25.8	11.4	S 0 05.1	11.2	58.0
18	88 04.7	S21 53.5	206 56.2	11.3	S 0 16.3	11.2	58.1
19	103 04.4	53.1	221 26.5	11.3	0 27.5	11.2	58.1
20	118 04.2	52.7	235 56.8	11.3	0 38.7	11.2	58.1
21	133 03.9	·· 52.3	250 27.1	11.3	0 49.9	11.2	58.1
22	148 03.7	51.9	264 57.4	11.2	1 01.1	11.2	58.1
23	163 03.4	51.6	279 27.6	11.2	1 12.3	11.2	58.2
11 00	178 03.2	S21 51.2	293 57.8	11.2	S 1 23.5	11.3	58.2
01	193 02.9	50.8	308 28.0	11.2	1 34.8	11.2	58.2
02	208 02.7	50.4	322 58.2	11.1	1 46.0	11.2	58.2
03	223 02.4	·· 50.0	337 28.3	11.1	1 57.2	11.2	58.2
04	238 02.2	49.6	351 58.4	11.1	2 08.4	11.1	58.3
05	253 01.9	49.2	6 28.5	11.1	2 19.5	11.2	58.3
06	268 01.7	S21 48.8	20 58.6	11.0	S 2 30.7	11.2	58.3
07	283 01.4	48.5	35 28.6	11.0	2 41.9	11.2	58.3
08	298 01.2	48.1	49 58.6	11.0	2 53.1	11.2	58.3
T 09	313 00.9	·· 47.7	64 28.6	10.9	3 04.3	11.1	58.3
U 10	328 00.7	47.3	78 58.5	10.9	3 15.4	11.1	58.4
E 11	343 00.4	46.9	93 28.4	10.9	3 26.5	11.2	58.4
S 12	358 00.2	S21 46.5	107 58.3	10.8	S 3 37.7	11.1	58.4
D 13	13 00.0	46.1	122 28.1	10.9	3 48.8	11.1	58.4
A 14	27 59.7	45.7	136 58.0	10.7	3 59.9	11.1	58.4
Y 15	42 59.5	·· 45.3	151 27.7	10.8	4 11.0	11.1	58.5
16	57 59.2	44.9	165 57.5	10.7	4 22.1	11.0	58.5
17	72 59.0	44.5	180 27.2	10.6	4 33.1	11.0	58.5
18	87 58.7	S21 44.1	194 56.8	10.7	S 4 44.1	11.1	58.5
19	102 58.5	43.7	209 26.5	10.6	4 55.2	11.0	58.5
20	117 58.2	43.3	223 56.1	10.5	5 06.2	10.9	58.6
21	132 58.0	·· 42.9	238 25.6	10.6	5 17.1	11.0	58.6
22	147 57.8	42.5	252 55.2	10.4	5 28.1	10.9	58.6
23	162 57.5	42.1	267 24.6	10.5	5 39.0	10.9	58.6
12 00	177 57.3	S21 41.7	281 54.1	10.4	S 5 49.9	10.9	58.6
01	192 57.0	41.3	296 23.5	10.3	6 00.8	10.8	58.6
02	207 56.8	40.9	310 52.8	10.3	6 11.6	10.9	58.7
03	222 56.5	·· 40.5	325 22.1	10.3	6 22.5	10.8	58.7
04	237 56.3	40.1	339 51.4	10.2	6 33.3	10.7	58.7
05	252 56.1	39.7	354 20.6	10.2	6 44.0	10.8	58.7
06	267 55.8	S21 39.3	8 49.8	10.2	S 6 54.8	10.7	58.7
W 07	282 55.6	38.9	23 19.0	10.1	7 05.5	10.6	58.7
E 08	297 55.3	38.5	37 48.1	10.0	7 16.1	10.7	58.8
D 09	312 55.1	·· 38.1	52 17.1	10.0	7 26.8	10.6	58.8
N 10	327 54.9	37.6	66 46.1	10.0	7 37.4	10.5	58.8
E 11	342 54.6	37.2	81 15.1	9.9	7 47.9	10.5	58.8
S 12	357 54.4	S21 36.8	95 44.0	9.8	S 7 58.4	10.5	58.8
D 13	12 54.1	36.4	110 12.8	9.9	8 08.9	10.5	58.9
A 14	27 53.9	36.0	124 41.7	9.7	8 19.4	10.4	58.9
Y 15	42 53.7	·· 35.6	139 10.4	9.7	8 29.8	10.3	58.9
16	57 53.4	35.2	153 39.1	9.7	8 40.1	10.3	58.9
17	72 53.2	34.8	168 07.8	9.6	8 50.4	10.3	58.9
18	87 52.9	S21 34.3	182 36.4	9.6	S 9 00.7	10.2	58.9
19	102 52.7	33.9	197 05.0	9.5	9 10.9	10.2	59.0
20	117 52.5	33.5	211 33.5	9.4	9 21.1	10.1	59.0
21	132 52.2	·· 33.1	226 01.9	9.4	9 31.2	10.1	59.0
22	147 52.0	32.7	240 30.3	9.4	9 41.3	10.1	59.0
23	162 51.8	32.3	254 58.7	9.3	9 51.4	9.9	59.0
	S.D. 16.3	*d* 0.4	S.D. 15.8		15.9		16.0

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 10	Moonrise 11	Moonrise 12	Moonrise 13
°	h m	h m	h m	h m	h m	h m	h m
N 72	08 10	10 08	■	22 37	24 30	00 30	02 28
N 70	07 53	09 29	■	22 35	24 21	00 21	02 10
68	07 40	09 02	10 53	22 34	24 13	00 13	01 55
66	07 29	08 42	10 05	22 33	24 07	00 07	01 44
64	07 20	08 25	09 34	22 32	24 02	00 02	01 34
62	07 12	08 11	09 12	22 31	23 58	25 26	01 26
60	07 05	07 59	08 54	22 30	23 54	25 19	01 19
N 58	06 58	07 49	08 38	22 29	23 51	25 13	01 13
56	06 52	07 40	08 26	22 29	23 48	25 08	01 08
54	06 47	07 32	08 14	22 28	23 45	25 03	01 03
52	06 42	07 25	08 04	22 28	23 43	24 58	00 58
50	06 37	07 18	07 55	22 27	23 40	24 54	00 54
45	06 27	07 04	07 37	22 26	23 36	24 46	00 46
N 40	06 18	06 51	07 21	22 25	23 32	24 39	00 39
35	06 09	06 41	07 08	22 25	23 28	24 33	00 33
30	06 02	06 31	06 57	22 24	23 25	24 27	00 27
20	05 47	06 14	06 38	22 23	23 20	24 18	00 18
N 10	05 32	05 58	06 20	22 22	23 16	24 10	00 10
0	05 16	05 42	06 04	22 21	23 11	24 03	00 03
S 10	04 59	05 25	05 48	22 21	23 07	23 56	24 46
20	04 38	05 06	05 30	22 20	23 03	23 48	24 36
30	04 11	04 43	05 10	22 19	22 58	23 39	24 23
35	03 53	04 29	04 58	22 18	22 55	23 34	24 16
40	03 32	04 12	04 44	22 18	22 52	23 28	24 08
45	03 04	03 52	04 28	22 17	22 48	23 21	23 58
S 50	02 25	03 25	04 07	22 16	22 44	23 14	23 47
52	02 03	03 12	03 58	22 16	22 42	23 10	23 42
54	01 32	02 56	03 47	22 16	22 40	23 06	23 36
56	00 31	02 37	03 34	22 15	22 37	23 02	23 30
58	////	02 13	03 19	22 15	22 35	22 57	23 23
S 60	////	01 40	03 02	22 14	22 32	22 51	23 15

Lat.	Sunset	Twilight Civil	Twilight Naut.	Moonset 10	Moonset 11	Moonset 12	Moonset 13
°	h m	h m	h m	h m	h m	h m	h m
N 72	■	14 09	16 07	10 10	10 02	09 54	09 44
N 70	■	14 48	16 23	10 08	10 06	10 05	10 04
68	13 23	15 14	16 36	10 07	10 10	10 14	10 19
66	14 12	15 35	16 47	10 06	10 13	10 22	10 32
64	14 42	15 51	16 57	10 05	10 16	10 28	10 43
62	15 05	16 05	17 05	10 05	10 18	10 34	10 52
60	15 23	16 17	17 12	10 04	10 21	10 39	11 00
N 58	15 38	16 27	17 18	10 03	10 22	10 43	11 07
56	15 51	16 36	17 24	10 03	10 24	10 47	11 13
54	16 02	16 44	17 29	10 02	10 26	10 50	11 18
52	16 12	16 52	17 34	10 02	10 27	10 54	11 23
50	16 21	16 58	17 39	10 01	10 28	10 56	11 28
45	16 40	17 13	17 49	10 01	10 31	11 03	11 38
N 40	16 55	17 25	17 58	10 00	10 33	11 08	11 46
35	17 08	17 35	18 07	09 59	10 35	11 13	11 53
30	17 19	17 45	18 15	09 59	10 37	11 17	11 59
20	17 39	18 02	18 29	09 58	10 40	11 24	12 10
N 10	17 56	18 18	18 44	09 57	10 43	11 30	12 19
0	18 12	18 34	19 00	09 56	10 45	11 36	12 28
S 10	18 28	18 51	19 17	09 55	10 48	11 41	12 37
20	18 45	19 10	19 38	09 54	10 50	11 48	12 47
30	19 06	19 32	20 05	09 53	10 53	11 55	12 58
35	19 17	19 47	20 22	09 52	10 55	11 59	13 04
40	19 31	20 03	20 43	09 51	10 57	12 03	13 11
45	19 48	20 24	21 11	09 50	10 59	12 09	13 20
S 50	20 08	20 50	21 50	09 49	11 02	12 15	13 30
52	20 18	21 03	22 11	09 49	11 03	12 18	13 34
54	20 28	21 19	22 41	09 48	11 04	12 22	13 40
56	20 41	21 37	23 36	09 48	11 06	12 25	13 45
58	20 55	22 01	////	09 47	11 08	12 29	13 52
S 60	21 13	22 33	////	09 46	11 09	12 34	13 59

Day	SUN Eqn. of Time 00ʰ	SUN Eqn. of Time 12ʰ	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
	m s	m s	h m	h m	h m	d	
10	07 23	07 35	12 08	03 44	16 09	20	◑
11	07 47	07 59	12 08	04 33	16 58	21	
12	08 10	08 22	12 08	05 23	17 49	22	

1977 JANUARY 13, 14, 15 (THURS., FRI., SAT.)

	G.M.T.	ARIES	VENUS −4.0		MARS +1.5		JUPITER −2.2		SATURN +0.1	
		G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
	d h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
	13 00	112 21.6	131 09.7	S 8 50.4	192 31.0	S23 51.8	63 21.1	N17 09.8	334 34.5	N17 11.7
	01	127 24.0	146 09.7	49.2	207 31.4	51.6	78 23.6	09.8	349 37.2	11.7
	02	142 26.5	161 09.7	48.0	222 31.8	51.5	93 26.1	09.8	4 39.8	11.8
	03	157 29.0	176 09.7	·· 46.8	237 32.2	·· 51.4	108 28.6	·· 09.9	19 42.4	·· 11.8
	04	172 31.4	191 09.7	45.6	252 32.6	51.3	123 31.1	09.9	34 45.1	11.9
	05	187 33.9	206 09.7	44.4	267 33.0	51.2	138 33.6	09.9	49 47.7	12.0
	06	202 36.4	221 09.7	S 8 43.2	282 33.4	S23 51.1	153 36.0	N17 09.9	64 50.4	N17 12.0
	07	217 38.8	236 09.7	42.0	297 33.8	51.0	168 38.5	09.9	79 53.0	12.1
T	08	232 41.3	251 09.7	40.8	312 34.2	50.9	183 41.0	09.9	94 55.7	12.1
H	09	247 43.8	266 09.7	·· 39.6	327 34.6	·· 50.8	198 43.5	·· 09.9	109 58.3	·· 12.2
U	10	262 46.2	281 09.8	38.4	342 35.0	50.7	213 46.0	09.9	125 00.9	12.3
R	11	277 48.7	296 09.8	37.2	357 35.4	50.6	228 48.5	09.9	140 03.6	12.3
S	12	292 51.2	311 09.8	S 8 36.0	12 35.8	S23 50.4	243 51.0	N17 09.9	155 06.2	N17 12.4
D	13	307 53.6	326 09.8	34.7	27 36.2	50.3	258 53.4	09.9	170 08.9	12.4
A	14	322 56.1	341 09.8	33.5	42 36.6	50.2	273 55.9	09.9	185 11.5	12.5
Y	15	337 58.5	356 09.8	·· 32.3	57 37.0	·· 50.1	288 58.4	·· 09.9	200 14.2	·· 12.5
	16	353 01.0	11 09.8	31.1	72 37.4	50.0	304 00.9	09.9	215 16.8	12.6
	17	8 03.5	26 09.8	29.9	87 37.8	49.9	319 03.4	09.9	230 19.5	12.7
	18	23 05.9	41 09.9	S 8 28.7	102 38.2	S23 49.8	334 05.9	N17 10.0	245 22.1	N17 12.7
	19	38 08.4	56 09.9	27.5	117 38.6	49.6	349 08.3	10.0	260 24.7	12.8
	20	53 10.9	71 09.9	26.3	132 39.0	49.5	4 10.8	10.0	275 27.4	12.8
	21	68 13.3	86 09.9	·· 25.1	147 39.4	·· 49.4	19 13.3	·· 10.0	290 30.0	·· 12.9
	22	83 15.8	101 09.9	23.9	162 39.8	49.3	34 15.8	10.0	305 32.7	13.0
	23	98 18.3	116 10.0	22.7	177 40.2	49.2	49 18.3	10.0	320 35.3	13.0
	14 00	113 20.7	131 10.0	S 8 21.5	192 40.6	S23 49.1	64 20.7	N17 10.0	335 38.0	N17 13.1
	01	128 23.2	146 10.0	20.3	207 41.0	48.9	79 23.2	10.0	350 40.6	13.1
	02	143 25.7	161 10.0	19.1	222 41.4	48.8	94 25.7	10.0	5 43.3	13.2
	03	158 28.1	176 10.0	·· 17.9	237 41.8	·· 48.7	109 28.2	·· 10.0	20 45.9	·· 13.3
	04	173 30.6	191 10.1	16.7	252 42.2	48.6	124 30.7	10.0	35 48.5	13.3
	05	188 33.0	206 10.1	15.5	267 42.6	48.5	139 33.1	10.0	50 51.2	13.4
	06	203 35.5	221 10.1	S 8 14.3	282 43.0	S23 48.4	154 35.6	N17 10.0	65 53.8	N17 13.4
	07	218 38.0	236 10.1	13.0	297 43.4	48.2	169 38.1	10.1	80 56.5	13.5
	08	233 40.4	251 10.2	11.8	312 43.8	48.1	184 40.6	10.1	95 59.1	13.6
F	09	248 42.9	266 10.2	·· 10.6	327 44.2	·· 48.0	199 43.1	·· 10.1	111 01.8	·· 13.6
R	10	263 45.4	281 10.2	09.4	342 44.6	47.9	214 45.5	10.1	126 04.4	13.7
I	11	278 47.8	296 10.3	08.2	357 45.0	47.7	229 48.0	10.1	141 07.1	13.7
D	12	293 50.3	311 10.3	S 8 07.0	12 45.4	S23 47.6	244 50.5	N17 10.1	156 09.7	N17 13.8
A	13	308 52.8	326 10.3	05.8	27 45.8	47.5	259 53.0	10.1	171 12.4	13.9
Y	14	323 55.2	341 10.4	04.6	42 46.2	47.4	274 55.4	10.1	186 15.0	13.9
	15	338 57.7	356 10.4	·· 03.4	57 46.6	·· 47.3	289 57.9	·· 10.1	201 17.6	·· 14.0
	16	354 00.1	11 10.4	02.2	72 47.0	47.1	305 00.4	10.1	216 20.3	14.0
	17	9 02.6	26 10.5	8 01.0	87 47.4	47.0	320 02.9	10.1	231 22.9	14.1
	18	24 05.1	41 10.5	S 7 59.7	102 47.8	S23 46.9	335 05.3	N17 10.2	246 25.6	N17 14.2
	19	39 07.5	56 10.5	58.5	117 48.2	46.8	350 07.8	10.2	261 28.2	14.2
	20	54 10.0	71 10.6	57.3	132 48.6	46.6	5 10.3	10.2	276 30.9	14.3
	21	69 12.5	86 10.6	·· 56.1	147 49.0	·· 46.5	20 12.7	·· 10.2	291 33.5	·· 14.3
	22	84 14.9	101 10.6	54.9	162 49.4	46.4	35 15.2	10.2	306 36.2	14.4
	23	99 17.4	116 10.7	53.7	177 49.8	46.2	50 17.7	10.2	321 38.8	14.4
	15 00	114 19.9	131 10.7	S 7 52.5	192 50.2	S23 46.1	65 20.2	N17 10.2	336 41.5	N17 14.5
	01	129 22.3	146 10.8	51.3	207 50.6	46.0	80 22.6	10.2	351 44.1	14.6
	02	144 24.8	161 10.8	50.1	222 51.0	45.9	95 25.1	10.2	6 46.8	14.6
	03	159 27.3	176 10.8	·· 48.8	237 51.4	·· 45.7	110 27.6	·· 10.2	21 49.4	·· 14.7
	04	174 29.7	191 10.9	47.6	252 51.8	45.6	125 30.0	10.3	36 52.1	14.7
	05	189 32.2	206 10.9	46.4	267 52.2	45.5	140 32.5	10.3	51 54.7	14.8
	06	204 34.6	221 11.0	S 7 45.2	282 52.6	S23 45.3	155 35.0	N17 10.3	66 57.4	N17 14.9
	07	219 37.1	236 11.0	44.0	297 53.0	45.2	170 37.4	10.3	82 00.0	14.9
S	08	234 39.6	251 11.1	42.8	312 53.4	45.1	185 39.9	10.3	97 02.7	15.0
A	09	249 42.0	266 11.1	·· 41.6	327 53.8	·· 44.9	200 42.4	·· 10.3	112 05.3	·· 15.0
T	10	264 44.5	281 11.2	40.3	342 54.2	44.8	215 44.9	10.3	127 07.9	15.1
U	11	279 47.0	296 11.2	39.1	357 54.6	44.7	230 47.3	10.3	142 10.6	15.2
R	12	294 49.4	311 11.3	S 7 37.9	12 55.0	S23 44.5	245 49.8	N17 10.3	157 13.2	N17 15.2
D	13	309 51.9	326 11.3	36.7	27 55.4	44.4	260 52.3	10.4	172 15.9	15.3
A	14	324 54.4	341 11.4	35.5	42 55.8	44.3	275 54.7	10.4	187 18.5	15.3
Y	15	339 56.8	356 11.4	·· 34.3	57 56.2	·· 44.1	290 57.2	·· 10.4	202 21.2	·· 15.4
	16	354 59.3	11 11.5	33.1	72 56.6	44.0	305 59.6	10.4	217 23.8	15.5
	17	10 01.8	26 11.5	31.8	87 57.0	43.9	321 02.1	10.4	232 26.5	15.5
	18	25 04.2	41 11.6	S 7 30.6	102 57.4	S23 43.7	336 04.6	N17 10.4	247 29.1	N17 15.6
	19	40 06.7	56 11.6	29.4	117 57.8	43.6	351 07.0	10.4	262 31.8	15.6
	20	55 09.1	71 11.7	28.2	132 58.2	43.5	6 09.5	10.4	277 34.4	15.7
	21	70 11.6	86 11.7	·· 27.0	147 58.6	·· 43.3	21 12.0	·· 10.5	292 37.1	·· 15.8
	22	85 14.1	101 11.8	25.8	162 59.0	43.2	36 14.4	10.5	307 39.7	15.8
	23	100 16.5	116 11.8	24.6	177 59.4	43.1	51 16.9	10.5	322 42.4	15.9
	Mer. Pass.	h m 16 23.9	*v* 0.0	*d* 1.2	*v* 0.4	*d* 0.1	*v* 2.5	*d* 0.0	*v* 2.6	*d* 0.1

STARS		
Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 39.0	S40 24.1
Achernar	335 47.2	S57 21.5
Acrux	173 39.7	S62 58.1
Adhara	255 33.7	S28 56.6
Aldebaran	291 20.6	N16 27.8
Alioth	166 44.7	N56 04.7
Alkaid	153 20.5	N49 25.4
Al Na'ir	28 18.5	S47 04.4
Alnilam	276 13.9	S 1 13.1
Alphard	218 22.7	S 8 33.7
Alphecca	126 34.4	N26 47.4
Alpheratz	358 12.0	N28 58.0
Altair	62 35.3	N 8 48.5
Ankaa	353 42.8	S42 26.1
Antares	113 00.1	S26 22.8
Arcturus	146 20.8	N19 17.9
Atria	108 27.0	S68 59.0
Avior	234 28.5	S59 26.2
Bellatrix	279 01.1	N 6 19.6
Betelgeuse	271 30.6	N 7 24.1
Canopus	264 07.8	S52 41.2
Capella	281 14.5	N45 58.5
Deneb	49 50.6	N45 12.0
Denebola	183 01.4	N14 41.8
Diphda	349 23.4	S18 06.9
Dubhe	194 24.8	N61 52.2
Elnath	278 46.9	N28 35.3
Eltanin	90 59.4	N51 29.5
Enif	34 14.3	N 9 46.3
Fomalhaut	15 54.4	S29 44.7
Gacrux	172 31.2	S56 58.9
Gienah	176 20.4	S17 24.9
Hadar	149 26.8	S60 15.5
Hamal	328 31.6	N23 21.3
Kaus Aust.	84 20.5	S34 23.7
Kochab	137 19.5	N74 14.7
Markab	14 05.8	N15 05.0
Menkar	314 43.6	N 3 59.9
Menkent	148 39.9	S36 15.3
Miaplacidus	221 44.5	S69 37.4
Mirfak	309 19.3	N49 47.0
Nunki	76 32.6	S26 19.5
Peacock	54 02.9	S56 48.5
Pollux	244 00.8	N28 04.8
Procyon	245 28.0	N 5 16.9
Rasalhague	96 32.2	N12 34.6
Regulus	208 12.4	N12 04.6
Rigel	281 38.1	S 8 13.8
Rigil Kent.	140 29.3	S60 44.1
Sabik	102 44.2	S15 41.7
Schedar	350 11.9	N56 25.0
Shaula	96 59.5	S37 05.1
Sirius	258 57.5	S16 41.3
Spica	159 00.1	S11 02.5
Suhail	223 12.1	S43 20.4
Vega	80 57.9	N38 45.7
Zuben'ubi	137 35.9	S15 56.7

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	17 49.3	15 15
Mars	79 19.9	11 09
Jupiter	311 00.0	19 39
Saturn	222 17.2	1 37

G.M.T.		SUN G.H.A.	SUN Dec.	MOON G.H.A.	MOON v	MOON Dec.	MOON d	MOON H.P.
d	h	° ′	° ′	° ′	′	° ′	′	′
13	00	177 51.5	S21 31.8	269 27.0	9.2	S10 01.3	10.0	59.0
	01	192 51.3	31.4	283 55.2	9.2	10 11.3	9.8	59.1
	02	207 51.0	31.0	298 23.4	9.1	10 21.1	9.8	59.1
	03	222 50.8	·· 30.6	312 51.5	9.1	10 30.9	9.8	59.1
	04	237 50.6	30.1	327 19.6	9.0	10 40.7	9.7	59.1
	05	252 50.3	29.7	341 47.6	9.0	10 50.4	9.7	59.1
	06	267 50.1	S21 29.3	356 15.6	8.9	S11 00.1	9.5	59.1
	07	282 49.9	28.9	10 43.5	8.9	11 09.6	9.6	59.2
T	08	297 49.6	28.5	25 11.4	8.8	11 19.2	9.4	59.2
H	09	312 49.4	·· 28.0	39 39.2	8.7	11 28.6	9.4	59.2
U	10	327 49.2	27.6	54 06.9	8.7	11 38.0	9.4	59.2
R	11	342 48.9	27.2	68 34.6	8.6	11 47.4	9.2	59.2
S	12	357 48.7	S21 26.7	83 02.2	8.6	S11 56.6	9.2	59.2
D	13	12 48.5	26.3	97 29.8	8.5	12 05.8	9.2	59.2
A	14	27 48.2	25.9	111 57.3	8.4	12 15.0	9.0	59.3
Y	15	42 48.0	·· 25.5	126 24.7	8.4	12 24.0	9.0	59.3
	16	57 47.8	25.0	140 52.1	8.3	12 33.0	9.0	59.3
	17	72 47.5	24.6	155 19.4	8.3	12 42.0	8.8	59.3
	18	87 47.3	S21 24.2	169 46.7	8.2	S12 50.8	8.8	59.3
	19	102 47.1	23.7	184 13.9	8.2	12 59.6	8.7	59.3
	20	117 46.8	23.3	198 41.1	8.1	13 08.3	8.6	59.3
	21	132 46.6	·· 22.9	213 08.2	8.0	13 16.9	8.6	59.4
	22	147 46.4	22.4	227 35.2	8.0	13 25.5	8.4	59.4
	23	162 46.2	22.0	242 02.2	7.9	13 33.9	8.4	59.4
14	00	177 45.9	S21 21.5	256 29.1	7.8	S13 42.3	8.4	59.4
	01	192 45.7	21.1	270 55.9	7.8	13 50.7	8.2	59.4
	02	207 45.5	20.7	285 22.7	7.8	13 58.9	8.1	59.4
	03	222 45.2	·· 20.2	299 49.5	7.6	14 07.0	8.1	59.4
	04	237 45.0	19.8	314 16.1	7.6	14 15.1	8.0	59.5
	05	252 44.8	19.3	328 42.7	7.6	14 23.1	7.9	59.5
	06	267 44.5	S21 18.9	343 09.3	7.5	S14 31.0	7.8	59.5
	07	282 44.3	18.5	357 35.8	7.4	14 38.8	7.7	59.5
	08	297 44.1	18.0	12 02.2	7.4	14 46.5	7.6	59.5
F	09	312 43.9	·· 17.6	26 28.6	7.3	14 54.1	7.6	59.5
R	10	327 43.6	17.1	40 54.9	7.3	15 01.7	7.4	59.5
I	11	342 43.4	16.7	55 21.2	7.2	15 09.1	7.4	59.5
D	12	357 43.2	S21 16.2	69 47.4	7.1	S15 16.5	7.2	59.6
A	13	12 43.0	15.8	84 13.5	7.1	15 23.7	7.2	59.6
Y	14	27 42.7	15.3	98 39.6	7.1	15 30.9	7.0	59.6
	15	42 42.5	·· 14.9	113 05.7	6.9	15 37.9	7.0	59.6
	16	57 42.3	14.5	127 31.6	6.9	15 44.9	6.9	59.6
	17	72 42.1	14.0	141 57.5	6.9	15 51.8	6.8	59.6
	18	87 41.8	S21 13.6	156 23.4	6.8	S15 58.6	6.6	59.6
	19	102 41.6	13.1	170 49.2	6.8	16 05.2	6.6	59.6
	20	117 41.4	12.6	185 15.0	6.6	16 11.8	6.5	59.6
	21	132 41.2	·· 12.2	199 40.6	6.7	16 18.3	6.3	59.6
	22	147 40.9	11.7	214 06.3	6.6	16 24.6	6.3	59.7
	23	162 40.7	11.3	228 31.9	6.5	16 30.9	6.2	59.7
15	00	177 40.5	S21 10.8	242 57.4	6.5	S16 37.1	6.0	59.7
	01	192 40.3	10.4	257 22.9	6.4	16 43.1	5.9	59.7
	02	207 40.0	09.9	271 48.3	6.4	16 49.0	5.9	59.7
	03	222 39.8	·· 09.5	286 13.7	6.3	16 54.9	5.7	59.7
	04	237 39.6	09.0	300 39.0	6.3	17 00.6	5.6	59.7
	05	252 39.4	08.6	315 04.3	6.2	17 06.2	5.5	59.7
	06	267 39.1	S21 08.1	329 29.5	6.2	S17 11.7	5.4	59.7
	07	282 38.9	07.6	343 54.7	6.1	17 17.1	5.3	59.7
S	08	297 38.7	07.2	358 19.8	6.1	17 22.4	5.2	59.7
A	09	312 38.5	·· 06.7	12 44.9	6.0	17 27.6	5.0	59.7
T	10	327 38.3	06.3	27 09.9	6.0	17 32.6	4.9	59.8
U	11	342 38.0	05.8	41 34.9	6.0	17 37.5	4.9	59.8
R	12	357 37.8	S21 05.3	55 59.9	5.9	S17 42.4	4.7	59.8
D	13	12 37.6	04.9	70 24.8	5.8	17 47.1	4.5	59.8
A	14	27 37.4	04.4	84 49.6	5.8	17 51.6	4.5	59.8
Y	15	42 37.2	·· 03.9	99 14.4	5.8	17 56.1	4.3	59.8
	16	57 36.9	03.5	113 39.2	5.7	18 00.4	4.3	59.8
	17	72 36.7	03.0	128 03.9	5.7	18 04.7	4.1	59.8
	18	87 36.5	S21 02.5	142 28.6	5.7	S18 08.8	3.9	59.8
	19	102 36.3	02.1	156 53.3	5.6	18 12.7	3.9	59.8
	20	117 36.1	01.6	171 17.9	5.6	18 16.6	3.7	59.8
	21	132 35.9	·· 01.1	185 42.5	5.5	18 20.3	3.7	59.8
	22	147 35.6	00.7	200 07.0	5.6	18 24.0	3.4	59.8
	23	162 35.4	00.2	214 31.6	5.5	18 27.4	3.4	59.8
		S.D. 16.3	*d* 0.4	S.D. 16.1		16.2		16.3

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 13	Moonrise 14	Moonrise 15	Moonrise 16
°	h m	h m	h m	h m	h m	h m	h m
N 72	08 03	09 56	▬	02 28	04 35	07 06	▬
N 70	07 48	09 21	▬	02 10	04 03	05 59	07 49
68	07 36	08 56	10 38	01 55	03 40	05 22	06 55
66	07 25	08 36	09 56	01 44	03 22	04 57	06 22
64	07 17	08 21	09 28	01 34	03 07	04 37	05 58
62	07 09	08 08	09 07	01 26	02 55	04 21	05 39
60	07 02	07 56	08 49	01 19	02 45	04 07	05 23
N 58	06 56	07 46	08 35	01 13	02 36	03 56	05 10
56	06 50	07 38	08 23	01 08	02 28	03 46	04 58
54	06 45	07 30	08 12	01 03	02 21	03 37	04 48
52	06 40	07 23	08 02	00 58	02 15	03 29	04 40
50	06 36	07 17	07 54	00 54	02 09	03 22	04 32
45	06 26	07 03	07 35	00 46	01 57	03 07	04 15
N 40	06 17	06 51	07 21	00 39	01 47	02 55	04 01
35	06 09	06 40	07 08	00 33	01 38	02 44	03 49
30	06 02	06 31	06 57	00 27	01 31	02 35	03 39
20	05 47	06 14	06 38	00 18	01 18	02 20	03 21
N 10	05 33	05 59	06 21	00 10	01 07	02 06	03 06
0	05 17	05 43	06 05	00 03	00 57	01 53	02 52
S 10	05 00	05 27	05 50	24 46	00 46	01 41	02 38
20	04 40	05 08	05 33	24 36	00 36	01 27	02 22
30	04 13	04 46	05 13	24 23	00 23	01 12	02 05
35	03 57	04 32	05 01	24 16	00 16	01 03	01 55
40	03 36	04 16	04 48	24 08	00 08	00 53	01 44
45	03 09	03 56	04 32	23 58	24 41	00 41	01 30
S 50	02 31	03 30	04 12	23 47	24 27	00 27	01 14
52	02 10	03 17	04 02	23 42	24 20	00 20	01 06
54	01 43	03 02	03 52	23 36	24 13	00 13	00 58
56	00 56	02 44	03 40	23 30	24 05	00 05	00 48
58	////	02 22	03 25	23 23	23 55	24 37	00 37
S 60	////	01 52	03 09	23 15	23 45	24 25	00 25

Lat.	Sunset	Twilight Civil	Twilight Naut.	Moonset 13	Moonset 14	Moonset 15	Moonset 16
°	h m	h m	h m	h m	h m	h m	h m
N 72	▬	14 23	16 16	09 44	09 30	08 58	▬
N 70	▬	14 58	16 31	10 04	10 03	10 06	10 19
68	13 41	15 23	16 43	10 19	10 28	10 43	11 14
66	14 23	15 42	16 53	10 32	10 47	11 09	11 47
64	14 51	15 58	17 02	10 43	11 02	11 30	12 11
62	15 12	16 11	17 10	10 52	11 15	11 46	12 30
60	15 29	16 22	17 17	11 00	11 26	12 00	12 46
N 58	15 44	16 32	17 23	11 07	11 35	12 12	12 59
56	15 56	16 41	17 28	11 13	11 44	12 22	13 11
54	16 07	16 49	17 33	11 18	11 51	12 31	13 21
52	16 16	16 56	17 38	11 23	11 58	12 40	13 30
50	16 25	17 02	17 43	11 28	12 04	12 47	13 38
45	16 43	17 16	17 52	11 38	12 17	13 03	13 55
N 40	16 58	17 28	18 01	11 46	12 28	13 16	14 10
35	17 11	17 38	18 09	11 53	12 37	13 27	14 22
30	17 22	17 47	18 17	11 59	12 45	13 36	14 32
20	17 41	18 04	18 31	12 10	12 59	13 53	14 50
N 10	17 57	18 20	18 46	12 19	13 12	14 07	15 06
0	18 13	18 35	19 01	12 28	13 23	14 21	15 20
S 10	18 29	18 51	19 18	12 37	13 35	14 34	15 35
20	18 46	19 10	19 38	12 47	13 47	14 49	15 50
30	19 05	19 32	20 04	12 58	14 02	15 06	16 08
35	19 17	19 46	20 21	13 04	14 10	15 15	16 18
40	19 30	20 02	20 42	13 11	14 19	15 26	16 30
45	19 46	20 22	21 08	13 20	14 30	15 39	16 44
S 50	20 06	20 47	21 45	13 30	14 44	15 55	17 01
52	20 15	21 00	22 06	13 34	14 50	16 03	17 09
54	20 26	21 15	22 33	13 40	14 57	16 11	17 18
56	20 38	21 33	23 16	13 45	15 05	16 20	17 28
58	20 52	21 55	////	13 52	15 13	16 31	17 40
S 60	21 08	22 24	////	13 59	15 23	16 43	17 53

Day	SUN Eqn. of Time 00ʰ	SUN Eqn. of Time 12ʰ	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
	m s	m s	h m	h m	h m	d	
13	08 33	08 45	12 09	06 16	18 42	23	
14	08 56	09 07	12 09	07 10	19 38	24	☾
15	09 18	09 28	12 09	08 07	20 36	25	

1977 JANUARY 16, 17, 18 (SUN., MON., TUES.)

G.M.T.	ARIES	VENUS −4.0		MARS +1.5		JUPITER −2.1		SATURN +0.1	
	G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
d h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
16 00	115 19.0	131 11.9	S 7 23.3	192 59.8	S23 42.9	66 19.4	N17 10.5	337 45.0	N17 16.0
01	130 21.5	146 12.0	22.1	208 00.2	42.8	81 21.8	10.5	352 47.7	16.0
02	145 23.9	161 12.0	20.9	223 00.6	42.6	96 24.3	10.5	7 50.3	16.1
03	160 26.4	176 12.1	·· 19.7	238 01.0	·· 42.5	111 26.7	·· 10.5	22 53.0	·· 16.1
04	175 28.9	191 12.1	18.5	253 01.4	42.4	126 29.2	10.5	37 55.6	16.2
05	190 31.3	206 12.2	17.2	268 01.8	42.2	141 31.7	10.6	52 58.3	16.3
06	205 33.8	221 12.3	S 7 16.0	283 02.2	S23 42.1	156 34.1	N17 10.6	68 00.9	N17 16.3
07	220 36.2	236 12.3	14.8	298 02.6	41.9	171 36.6	10.6	83 03.6	16.4
08	235 38.7	251 12.4	13.6	313 03.0	41.8	186 39.0	10.6	98 06.2	16.4
S 09	250 41.2	266 12.5	·· 12.4	328 03.4	·· 41.6	201 41.5	·· 10.6	113 08.9	·· 16.5
U 10	265 43.6	281 12.5	11.2	343 03.8	41.5	216 44.0	10.6	128 11.5	16.6
N 11	280 46.1	296 12.6	09.9	358 04.2	41.4	231 46.4	10.6	143 14.2	16.6
D 12	295 48.6	311 12.7	S 7 08.7	13 04.6	S23 41.2	246 48.9	N17 10.6	158 16.8	N17 16.7
A 13	310 51.0	326 12.7	07.5	28 05.0	41.1	261 51.3	10.7	173 19.5	16.7
Y 14	325 53.5	341 12.8	06.3	43 05.4	40.9	276 53.8	10.7	188 22.1	16.8
15	340 56.0	356 12.9	·· 05.1	58 05.8	·· 40.8	291 56.3	·· 10.7	203 24.8	·· 16.9
16	355 58.4	11 12.9	03.8	73 06.2	40.6	306 58.7	10.7	218 27.4	16.9
17	11 00.9	26 13.0	02.6	88 06.6	40.5	322 01.2	10.7	233 30.1	17.0
18	26 03.4	41 13.1	S 7 01.4	103 07.0	S23 40.3	337 03.6	N17 10.7	248 32.7	N17 17.0
19	41 05.8	56 13.2	7 00.2	118 07.4	40.2	352 06.1	10.7	263 35.4	17.1
20	56 08.3	71 13.2	6 59.0	133 07.8	40.0	7 08.5	10.8	278 38.0	17.2
21	71 10.7	86 13.3	·· 57.7	148 08.2	·· 39.9	22 11.0	·· 10.8	293 40.7	·· 17.2
22	86 13.2	101 13.4	56.5	163 08.7	39.7	37 13.4	10.8	308 43.3	17.3
23	101 15.7	116 13.5	55.3	178 09.1	39.6	52 15.9	10.8	323 46.0	17.3
17 00	116 18.1	131 13.5	S 6 54.1	193 09.5	S23 39.4	67 18.4	N17 10.8	338 48.6	N17 17.4
01	131 20.6	146 13.6	52.9	208 09.9	39.3	82 20.8	10.8	353 51.3	17.5
02	146 23.1	161 13.7	51.6	223 10.3	39.1	97 23.3	10.8	8 53.9	17.5
03	161 25.5	176 13.8	·· 50.4	238 10.7	·· 39.0	112 25.7	·· 10.9	23 56.6	·· 17.6
04	176 28.0	191 13.9	49.2	253 11.1	38.8	127 28.2	10.9	38 59.2	17.6
05	191 30.5	206 13.9	48.0	268 11.5	38.7	142 30.6	10.9	54 01.9	17.7
06	206 32.9	221 14.0	S 6 46.8	283 11.9	S23 38.5	157 33.1	N17 10.9	69 04.6	N17 17.8
07	221 35.4	236 14.1	45.5	298 12.3	38.4	172 35.5	10.9	84 07.2	17.8
08	236 37.9	251 14.2	44.3	313 12.7	38.2	187 38.0	10.9	99 09.9	17.9
M 09	251 40.3	266 14.3	·· 43.1	328 13.1	·· 38.1	202 40.4	·· 11.0	114 12.5	·· 18.0
O 10	266 42.8	281 14.4	41.9	343 13.5	37.9	217 42.9	11.0	129 15.2	18.0
N 11	281 45.2	296 14.5	40.6	358 13.9	37.8	232 45.3	11.0	144 17.8	18.1
D 12	296 47.7	311 14.5	S 6 39.4	13 14.3	S23 37.6	247 47.8	N17 11.0	159 20.5	N17 18.1
A 13	311 50.2	326 14.6	38.2	28 14.7	37.5	262 50.2	11.0	174 23.1	18.2
Y 14	326 52.6	341 14.7	37.0	43 15.1	37.3	277 52.7	11.0	189 25.8	18.3
15	341 55.1	356 14.8	·· 35.7	58 15.5	·· 37.1	292 55.1	·· 11.0	204 28.4	·· 18.3
16	356 57.6	11 14.9	34.5	73 15.9	37.0	307 57.6	11.1	219 31.1	18.4
17	12 00.0	26 15.0	33.3	88 16.3	36.8	323 00.0	11.1	234 33.7	18.4
18	27 02.5	41 15.1	S 6 32.1	103 16.7	S23 36.7	338 02.5	N17 11.1	249 36.4	N17 18.5
19	42 05.0	56 15.2	30.9	118 17.1	36.5	353 04.9	11.1	264 39.0	18.6
20	57 07.4	71 15.3	29.6	133 17.5	36.4	8 07.4	11.1	279 41.7	18.6
21	72 09.9	86 15.4	·· 28.4	148 17.9	·· 36.2	23 09.8	·· 11.1	294 44.3	·· 18.7
22	87 12.4	101 15.5	27.2	163 18.3	36.0	38 12.2	11.2	309 47.0	18.7
23	102 14.8	116 15.6	26.0	178 18.7	35.9	53 14.7	11.2	324 49.6	18.8
18 00	117 17.3	131 15.6	S 6 24.7	193 19.1	S23 35.7	68 17.1	N17 11.2	339 52.3	N17 18.9
01	132 19.7	146 15.7	23.5	208 19.5	35.6	83 19.6	11.2	354 55.0	18.9
02	147 22.2	161 15.8	22.3	223 19.9	35.4	98 22.0	11.2	9 57.6	19.0
03	162 24.7	176 15.9	·· 21.1	238 20.3	·· 35.2	113 24.5	·· 11.2	25 00.3	·· 19.0
04	177 27.1	191 16.0	19.8	253 20.7	35.1	128 26.9	11.3	40 02.9	19.1
05	192 29.6	206 16.1	18.6	268 21.1	34.9	143 29.4	11.3	55 05.6	19.2
06	207 32.1	221 16.2	S 6 17.4	283 21.5	S23 34.7	158 31.8	N17 11.3	70 08.2	N17 19.2
07	222 34.5	236 16.3	16.2	298 21.9	34.6	173 34.2	11.3	85 10.9	19.3
T 08	237 37.0	251 16.4	14.9	313 22.3	34.4	188 36.7	11.3	100 13.5	19.4
U 09	252 39.5	266 16.6	·· 13.7	328 22.7	·· 34.3	203 39.1	·· 11.4	115 16.2	·· 19.4
E 10	267 41.9	281 16.7	12.5	343 23.1	34.1	218 41.6	11.4	130 18.8	19.5
S 11	282 44.4	296 16.8	11.2	358 23.5	33.9	233 44.0	11.4	145 21.5	19.5
D 12	297 46.8	311 16.9	S 6 10.0	13 23.9	S23 33.8	248 46.4	N17 11.4	160 24.1	N17 19.6
A 13	312 49.3	326 17.0	08.8	28 24.3	33.6	263 48.9	11.4	175 26.8	19.7
Y 14	327 51.8	341 17.1	07.6	43 24.7	33.4	278 51.3	11.4	190 29.5	19.7
15	342 54.2	356 17.2	·· 06.3	58 25.1	·· 33.3	293 53.8	·· 11.5	205 32.1	·· 19.8
16	357 56.7	11 17.3	05.1	73 25.5	33.1	308 56.2	11.5	220 34.8	19.8
17	12 59.2	26 17.4	03.9	88 25.9	32.9	323 58.6	11.5	235 37.4	19.9
18	28 01.6	41 17.5	S 6 02.7	103 26.3	S23 32.8	339 01.1	N17 11.5	250 40.1	N17 20.0
19	43 04.1	56 17.6	01.4	118 26.7	32.6	354 03.5	11.5	265 42.7	20.0
20	58 06.6	71 17.7	6 00.2	133 27.1	32.4	9 06.0	11.6	280 45.4	20.1
21	73 09.0	86 17.9	5 59.0	148 27.5	·· 32.2	24 08.4	·· 11.6	295 48.0	·· 20.2
22	88 11.5	101 18.0	57.7	163 27.9	32.1	39 10.8	11.6	310 50.7	20.2
23	103 14.0	116 18.1	56.5	178 28.3	31.9	54 13.3	11.6	325 53.3	20.3
Mer. Pass.	h m 16 12.1	*v* 0.1	*d* 1.2	*v* 0.4	*d* 0.2	*v* 2.4	*d* 0.0	*v* 2.7	*d* 0.1

STARS

Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 39.0	S40 24.1
Achernar	335 47.2	S57 21.5
Acrux	173 39.6	S62 58.1
Adhara	255 33.6	S28 56.6
Aldebaran	291 20.6	N16 27.8
Alioth	166 44.6	N56 04.7
Alkaid	153 20.5	N49 25.4
Al Na'ir	28 18.5	S47 04.4
Alnilam	276 13.9	S 1 13.1
Alphard	218 22.7	S 8 33.7
Alphecca	126 34.4	N26 47.4
Alpheratz	358 12.0	N28 58.0
Altair	62 35.3	N 8 48.5
Ankaa	353 42.9	S42 26.0
Antares	113 00.1	S26 22.8
Arcturus	146 20.8	N19 17.9
Atria	108 26.9	S68 58.9
Avior	234 28.5	S59 26.2
Bellatrix	279 01.1	N 6 19.6
Betelgeuse	271 30.6	N 7 24.1
Canopus	264 07.8	S52 41.2
Capella	281 14.5	N45 58.6
Deneb	49 50.6	N45 12.0
Denebola	183 01.4	N14 41.8
Diphda	349 23.4	S18 06.9
Dubhe	194 24.8	N61 52.2
Elnath	278 46.9	N28 35.3
Eltanin	90 59.4	N51 29.5
Enif	34 14.3	N 9 46.3
Fomalhaut	15 54.4	S29 44.7
Gacrux	172 31.2	S56 58.9
Gienah	176 20.3	S17 24.9
Hadar	149 26.8	S60 15.5
Hamal	328 31.6	N23 21.3
Kaus Aust.	84 20.5	S34 23.7
Kochab	137 19.4	N74 14.7
Markab	14 05.8	N15 05.0
Menkar	314 43.6	N 3 59.9
Menkent	148 39.9	S36 15.3
Miaplacidus	221 44.5	S69 37.4
Mirfak	309 19.3	N49 47.0
Nunki	76 32.6	S26 19.5
Peacock	54 02.9	S56 48.5
Pollux	244 00.8	N28 04.8
Procyon	245 28.0	N 5 16.9
Rasalhague	96 32.2	N12 34.6
Regulus	208 12.3	N12 04.6
Rigel	281 38.1	S 8 13.8
Rigil Kent.	140 29.2	S60 44.1
Sabik	102 44.2	S15 41.7
Schedar	350 11.9	N56 25.0
Shaula	96 59.4	S37 05.1
Sirius	258 57.5	S16 41.3
Spica	159 00.1	S11 02.5
Suhail	223 12.1	S43 20.5
Vega	80 57.9	N38 45.7
Zuben'ubi	137 35.8	S15 56.8

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	14 55.4	15 15
Mars	76 51.3	11 07
Jupiter	311 00.2	19 28
Saturn	222 30.5	1 25

1977 JANUARY 16, 17, 18 (SUN., MON., TUES.)

G.M.T.		SUN		MOON				
		G.H.A.	Dec.	G.H.A.	*v*	Dec.	*d*	H.P.
d	h	° ′	° ′	° ′	′	° ′	′	′
16	00	177 35.2	S20 59.7	228 56.1	5.4	S18 30.8	3.2	59.8
	01	192 35.0	59.3	243 20.5	5.4	18 34.0	3.1	59.8
	02	207 34.8	58.8	257 44.9	5.4	18 37.1	3.0	59.8
	03	222 34.6	· · 58.3	272 09.3	5.4	18 40.1	2.9	59.8
	04	237 34.3	57.8	286 33.7	5.3	18 43.0	2.7	59.8
	05	252 34.1	57.4	300 58.0	5.4	18 45.7	2.6	59.8
	06	267 33.9	S20 56.9	315 22.4	5.3	S18 48.3	2.5	59.8
	07	282 33.7	56.4	329 46.7	5.2	18 50.8	2.3	59.8
	08	297 33.5	55.9	344 10.9	5.3	18 53.1	2.3	59.8
S	09	312 33.3	· · 55.5	358 35.2	5.2	18 55.4	2.0	59.8
U	10	327 33.1	55.0	12 59.4	5.2	18 57.4	2.0	59.8
N	11	342 32.8	54.5	27 23.6	5.2	18 59.4	1.8	59.8
D	12	357 32.6	S20 54.0	41 47.8	5.2	S19 01.2	1.7	59.8
A	13	12 32.4	53.5	56 12.0	5.2	19 02.9	1.6	59.8
Y	14	27 32.2	53.1	70 36.2	5.1	19 04.5	1.4	59.8
	15	42 32.0	· · 52.6	85 00.3	5.1	19 05.9	1.3	59.8
	16	57 31.8	52.1	99 24.4	5.2	19 07.2	1.2	59.8
	17	72 31.6	51.6	113 48.6	5.1	19 08.4	1.0	59.8
	18	87 31.4	S20 51.1	128 12.7	5.1	S19 09.4	0.9	59.8
	19	102 31.1	50.6	142 36.8	5.1	19 10.3	0.8	59.8
	20	117 30.9	50.2	157 00.9	5.1	19 11.1	0.6	59.8
	21	132 30.7	· · 49.7	171 25.0	5.1	19 11.7	0.5	59.8
	22	147 30.5	49.2	185 49.1	5.1	19 12.2	0.4	59.8
	23	162 30.3	48.7	200 13.2	5.1	19 12.6	0.2	59.8
17	00	177 30.1	S20 48.2	214 37.3	5.1	S19 12.8	0.1	59.8
	01	192 29.9	47.7	229 01.4	5.1	19 12.9	0.0	59.8
	02	207 29.7	47.2	243 25.5	5.1	19 12.9	0.2	59.8
	03	222 29.5	· · 46.7	257 49.6	5.2	19 12.7	0.2	59.8
	04	237 29.3	46.3	272 13.8	5.1	19 12.5	0.5	59.8
	05	252 29.1	45.8	286 37.9	5.1	19 12.0	0.5	59.8
	06	267 28.8	S20 45.3	301 02.0	5.2	S19 11.5	0.7	59.8
	07	282 28.6	44.8	315 26.2	5.1	19 10.8	0.8	59.8
	08	297 28.4	44.3	329 50.3	5.2	19 10.0	1.0	59.8
M	09	312 28.2	· · 43.8	344 14.5	5.2	19 09.0	1.1	59.8
O	10	327 28.0	43.3	358 38.7	5.2	19 07.9	1.2	59.7
N	11	342 27.8	42.8	13 02.9	5.2	19 06.7	1.3	59.7
D	12	357 27.6	S20 42.3	27 27.1	5.2	S19 05.4	1.5	59.7
A	13	12 27.4	41.8	41 51.3	5.3	19 03.9	1.6	59.7
Y	14	27 27.2	41.3	56 15.6	5.2	19 02.3	1.7	59.7
	15	42 27.0	· · 40.8	70 39.8	5.3	19 00.6	1.9	59.7
	16	57 26.8	40.3	85 04.1	5.4	18 58.7	2.0	59.7
	17	72 26.6	39.8	99 28.5	5.3	18 56.7	2.1	59.7
	18	87 26.4	S20 39.3	113 52.8	5.4	S18 54.6	2.3	59.7
	19	102 26.2	38.8	128 17.2	5.4	18 52.3	2.4	59.7
	20	117 26.0	38.3	142 41.6	5.4	18 49.9	2.5	59.7
	21	132 25.8	· · 37.8	157 06.0	5.5	18 47.4	2.6	59.6
	22	147 25.6	37.3	171 30.5	5.5	18 44.8	2.8	59.6
	23	162 25.4	36.8	185 55.0	5.6	18 42.0	2.8	59.6
18	00	177 25.2	S20 36.3	200 19.6	5.5	S18 39.2	3.1	59.6
	01	192 25.0	35.8	214 44.1	5.6	18 36.1	3.1	59.6
	02	207 24.8	35.3	229 08.7	5.7	18 33.0	3.3	59.6
	03	222 24.6	· · 34.8	243 33.4	5.7	18 29.7	3.3	59.6
	04	237 24.4	34.3	257 58.1	5.7	18 26.4	3.5	59.6
	05	252 24.2	33.8	272 22.8	5.8	18 22.9	3.7	59.5
	06	267 24.0	S20 33.3	286 47.6	5.8	S18 19.2	3.7	59.5
	07	282 23.8	32.8	301 12.4	5.9	18 15.5	3.9	59.5
	08	297 23.6	32.2	315 37.3	5.9	18 11.6	4.0	59.5
T	09	312 23.4	· · 31.7	330 02.2	5.9	18 07.6	4.1	59.5
U	10	327 23.2	31.2	344 27.1	6.0	18 03.5	4.2	59.5
E	11	342 23.0	30.7	358 52.1	6.1	17 59.3	4.4	59.5
S	12	357 22.8	S20 30.2	13 17.2	6.1	S17 54.9	4.4	59.4
D	13	12 22.6	29.7	27 42.3	6.1	17 50.5	4.6	59.4
A	14	27 22.4	29.2	42 07.4	6.2	17 45.9	4.7	59.4
Y	15	42 22.2	· · 28.7	56 32.6	6.3	17 41.2	4.8	59.4
	16	57 22.0	28.1	70 57.9	6.3	17 36.4	4.9	59.4
	17	72 21.8	27.6	85 23.2	6.3	17 31.5	5.0	59.3
	18	87 21.6	S20 27.1	99 48.5	6.5	S17 26.5	5.2	59.3
	19	102 21.4	26.6	114 14.0	6.4	17 21.3	5.2	59.3
	20	117 21.2	26.1	128 39.4	6.6	17 16.1	5.4	59.3
	21	132 21.0	· · 25.6	143 05.0	6.6	17 10.7	5.4	59.3
	22	147 20.8	25.0	157 30.6	6.6	17 05.3	5.6	59.3
	23	162 20.6	24.5	171 56.2	6.7	16 59.7	5.7	59.2
		S.D. 16.3	*d* 0.5	S.D. 16.3		16.3		16.2

Lat.	Twilight		Sunrise	Moonrise			
	Naut.	Civil		16	17	18	19
°	h m	h m	h m	h m	h m	h m	h m
N 72	07 56	09 44	■	■	■	■	10 05
N 70	07 42	09 12	11 43	07 49	09 00	09 21	09 25
68	07 31	08 49	10 24	06 55	08 02	08 39	08 58
66	07 21	08 31	09 47	06 22	07 27	08 10	08 37
64	07 13	08 16	09 21	05 58	07 03	07 49	08 20
62	07 05	08 03	09 01	05 39	06 43	07 31	08 06
60	06 59	07 53	08 45	05 23	06 27	07 17	07 54
N 58	06 53	07 43	08 31	05 10	06 13	07 04	07 44
56	06 48	07 35	08 19	04 58	06 02	06 53	07 34
54	06 43	07 27	08 09	04 48	05 51	06 44	07 26
52	06 39	07 21	07 59	04 40	05 42	06 35	07 19
50	06 34	07 15	07 51	04 32	05 34	06 28	07 13
45	06 25	07 01	07 34	04 15	05 17	06 12	06 59
N 40	06 16	06 50	07 19	04 01	05 02	05 58	06 47
35	06 09	06 40	07 07	03 49	04 50	05 47	06 37
30	06 01	06 31	06 56	03 39	04 40	05 37	06 29
20	05 47	06 14	06 38	03 21	04 22	05 20	06 14
N 10	05 33	05 59	06 22	03 06	04 06	05 05	06 01
0	05 19	05 44	06 07	02 52	03 51	04 51	05 48
S 10	05 02	05 29	05 51	02 38	03 37	04 37	05 36
20	04 42	05 11	05 35	02 22	03 21	04 22	05 23
30	04 16	04 49	05 15	02 05	03 03	04 05	05 08
35	04 00	04 35	05 04	01 55	02 53	03 55	04 59
40	03 40	04 19	04 51	01 44	02 41	03 43	04 49
45	03 14	04 00	04 35	01 30	02 27	03 30	04 37
S 50	02 38	03 35	04 16	01 14	02 10	03 14	04 23
52	02 18	03 23	04 07	01 06	02 02	03 06	04 16
54	01 53	03 08	03 57	00 58	01 53	02 57	04 09
56	01 14	02 51	03 45	00 48	01 43	02 48	04 01
58	////	02 30	03 32	00 37	01 31	02 37	03 51
S 60	////	02 03	03 16	00 25	01 18	02 24	03 41

Lat.	Sunset	Twilight		Moonset			
		Civil	Naut.	16	17	18	19
°	h m	h m	h m	h m	h m	h m	h m
N 72	■	14 38	16 25	■	■	■	14 11
N 70	12 38	15 09	16 39	10 19	11 13	12 56	14 50
68	13 57	15 32	16 51	11 14	12 12	13 37	15 17
66	14 34	15 50	17 00	11 47	12 46	14 05	15 37
64	15 00	16 05	17 08	12 11	13 10	14 27	15 53
62	15 20	16 18	17 16	12 30	13 30	14 44	16 07
60	15 36	16 28	17 22	12 46	13 46	14 58	16 18
N 58	15 50	16 38	17 28	12 59	13 59	15 10	16 28
56	16 02	16 46	17 33	13 11	14 11	15 21	16 36
54	16 12	16 53	17 38	13 21	14 21	15 30	16 44
52	16 21	17 00	17 42	13 30	14 30	15 38	16 51
50	16 30	17 06	17 46	13 38	14 38	15 45	16 57
45	16 47	17 20	17 56	13 55	14 56	16 01	17 10
N 40	17 01	17 31	18 04	14 10	15 10	16 14	17 21
35	17 13	17 41	18 12	14 22	15 22	16 25	17 30
30	17 24	17 50	18 19	14 32	15 32	16 35	17 38
20	17 43	18 06	18 33	14 50	15 50	16 51	17 52
N 10	17 59	18 21	18 47	15 06	16 05	17 05	18 04
0	18 14	18 36	19 02	15 20	16 20	17 19	18 15
S 10	18 29	18 52	19 18	15 35	16 34	17 32	18 26
20	18 46	19 10	19 38	15 50	16 50	17 46	18 38
30	19 05	19 31	20 03	16 08	17 07	18 02	18 51
35	19 16	19 45	20 20	16 18	17 18	18 11	18 59
40	19 29	20 00	20 39	16 30	17 29	18 22	19 08
45	19 44	20 20	21 05	16 44	17 43	18 34	19 18
S 50	20 03	20 44	21 41	17 01	18 00	18 49	19 30
52	20 12	20 56	22 00	17 09	18 08	18 56	19 36
54	20 22	21 11	22 25	17 18	18 16	19 04	19 42
56	20 34	21 27	23 01	17 28	18 26	19 13	19 49
58	20 47	21 48	////	17 40	18 37	19 22	19 57
S 60	21 03	22 15	////	17 53	18 50	19 33	20 06

Day	SUN			MOON			
	Eqn. of Time		Mer. Pass.	Mer. Pass.		Age	Phase
	00ʰ	12ʰ		Upper	Lower		
	m s	m s	h m	h m	h m	d	
16	09 39	09 49	12 10	09 06	21 36	26	●
17	09 59	10 09	12 10	10 06	22 35	27	
18	10 19	10 29	12 10	11 05	23 34	28	

1977 JANUARY 19, 20, 21 (WED., THURS., FRI.)

	G.M.T.	ARIES	VENUS −4.0		MARS +1.5		JUPITER −2.1		SATURN +0.1	
		G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
	d h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
	19 00	118 16.4	131 18.2	S 5 55.3	193 28.7	S23 31.7	69 15.7	N17 11.6	340 56.0	N17 20.3
	01	133 18.9	146 18.3	54.1	208 29.1	31.6	84 18.1	11.7	355 58.7	20.4
	02	148 21.3	161 18.4	52.8	223 29.5	31.4	99 20.6	11.7	11 01.3	20.5
	03	163 23.8	176 18.6	·· 51.6	238 29.9	·· 31.2	114 23.0	·· 11.7	26 04.0	·· 20.5
	04	178 26.3	191 18.7	50.4	253 30.3	31.0	129 25.4	11.7	41 06.6	20.6
	05	193 28.7	206 18.8	49.2	268 30.7	30.9	144 27.9	11.7	56 09.3	20.6
	06	208 31.2	221 18.9	S 5 47.9	283 31.1	S23 30.7	159 30.3	N17 11.7	71 11.9	N17 20.7
W	07	223 33.7	236 19.0	46.7	298 31.5	30.5	174 32.8	11.8	86 14.6	20.8
E	08	238 36.1	251 19.2	45.5	313 31.9	30.3	189 35.2	11.8	101 17.2	20.8
D	09	253 38.6	266 19.3	·· 44.2	328 32.3	·· 30.2	204 37.6	·· 11.8	116 19.9	·· 20.9
N	10	268 41.1	281 19.4	43.0	343 32.7	30.0	219 40.1	11.8	131 22.6	21.0
E	11	283 43.5	296 19.5	41.8	358 33.1	29.8	234 42.5	11.8	146 25.2	21.0
S	12	298 46.0	311 19.7	S 5 40.5	13 33.5	S23 29.6	249 44.9	N17 11.9	161 27.9	N17 21.1
D	13	313 48.5	326 19.8	39.3	28 33.9	29.5	264 47.3	11.9	176 30.5	21.1
A	14	328 50.9	341 19.9	38.1	43 34.3	29.3	279 49.8	11.9	191 33.2	21.2
Y	15	343 53.4	356 20.0	·· 36.9	58 34.7	·· 29.1	294 52.2	·· 11.9	206 35.8	·· 21.3
	16	358 55.8	11 20.2	35.6	73 35.1	28.9	309 54.6	12.0	221 38.5	21.3
	17	13 58.3	26 20.3	34.4	88 35.5	28.8	324 57.1	12.0	236 41.1	21.4
	18	29 00.8	41 20.4	S 5 33.2	103 35.9	S23 28.6	339 59.5	N17 12.0	251 43.8	N17 21.4
	19	44 03.2	56 20.6	31.9	118 36.3	28.4	355 01.9	12.0	266 46.5	21.5
	20	59 05.7	71 20.7	30.7	133 36.7	28.2	10 04.4	12.0	281 49.1	21.6
	21	74 08.2	86 20.8	·· 29.5	148 37.1	·· 28.0	25 06.8	·· 12.1	296 51.8	·· 21.6
	22	89 10.6	101 21.0	28.2	163 37.5	27.8	40 09.2	12.1	311 54.4	21.7
	23	104 13.1	116 21.1	27.0	178 37.9	27.7	55 11.6	12.1	326 57.1	21.8
	20 00	119 15.6	131 21.2	S 5 25.8	193 38.3	S23 27.5	70 14.1	N17 12.1	341 59.7	N17 21.8
	01	134 18.0	146 21.4	24.6	208 38.7	27.3	85 16.5	12.1	357 02.4	21.9
	02	149 20.5	161 21.5	23.3	223 39.2	27.1	100 18.9	12.2	12 05.1	21.9
	03	164 22.9	176 21.6	·· 22.1	238 39.6	·· 26.9	115 21.4	·· 12.2	27 07.7	·· 22.0
	04	179 25.4	191 21.8	20.9	253 40.0	26.8	130 23.8	12.2	42 10.4	22.1
	05	194 27.9	206 21.9	19.6	268 40.4	26.6	145 26.2	12.2	57 13.0	22.1
	06	209 30.3	221 22.1	S 5 18.4	283 40.8	S23 26.4	160 28.6	N17 12.2	72 15.7	N17 22.2
	07	224 32.8	236 22.2	17.2	298 41.2	26.2	175 31.1	12.3	87 18.3	22.2
T	08	239 35.3	251 22.3	15.9	313 41.6	26.0	190 33.5	12.3	102 21.0	22.3
H	09	254 37.7	266 22.5	·· 14.7	328 42.0	·· 25.8	205 35.9	·· 12.3	117 23.7	·· 22.4
U	10	269 40.2	281 22.6	13.5	343 42.4	25.6	220 38.3	12.3	132 26.3	22.4
R	11	284 42.7	296 22.8	12.2	358 42.8	25.5	235 40.8	12.4	147 29.0	22.5
S	12	299 45.1	311 22.9	S 5 11.0	13 43.2	S23 25.3	250 43.2	N17 12.4	162 31.6	N17 22.6
D	13	314 47.6	326 23.1	09.8	28 43.6	25.1	265 45.6	12.4	177 34.3	22.6
A	14	329 50.1	341 23.2	08.5	43 44.0	24.9	280 48.0	12.4	192 36.9	22.7
Y	15	344 52.5	356 23.3	·· 07.3	58 44.4	·· 24.7	295 50.4	·· 12.5	207 39.6	·· 22.7
	16	359 55.0	11 23.5	06.1	73 44.8	24.5	310 52.9	12.5	222 42.3	22.8
	17	14 57.4	26 23.6	04.8	88 45.2	24.3	325 55.3	12.5	237 44.9	22.9
	18	29 59.9	41 23.8	S 5 03.6	103 45.6	S23 24.1	340 57.7	N17 12.5	252 47.6	N17 22.9
	19	45 02.4	56 23.9	02.4	118 46.0	23.9	356 00.1	12.5	267 50.2	23.0
	20	60 04.8	71 24.1	5 01.2	133 46.4	23.7	11 02.6	12.6	282 52.9	23.1
	21	75 07.3	86 24.2	4 59.9	148 46.8	·· 23.6	26 05.0	·· 12.6	297 55.5	·· 23.1
	22	90 09.8	101 24.4	58.7	163 47.2	23.4	41 07.4	12.6	312 58.2	23.2
	23	105 12.2	116 24.6	57.5	178 47.6	23.2	56 09.8	12.6	328 00.9	23.2
	21 00	120 14.7	131 24.7	S 4 56.2	193 48.0	S23 23.0	71 12.2	N17 12.7	343 03.5	N17 23.3
	01	135 17.2	146 24.9	55.0	208 48.4	22.8	86 14.6	12.7	358 06.2	23.4
	02	150 19.6	161 25.0	53.8	223 48.8	22.6	101 17.1	12.7	13 08.8	23.4
	03	165 22.1	176 25.2	·· 52.5	238 49.2	·· 22.4	116 19.5	·· 12.7	28 11.5	·· 23.5
	04	180 24.6	191 25.3	51.3	253 49.6	22.2	131 21.9	12.8	43 14.2	23.6
	05	195 27.0	206 25.5	50.1	268 50.0	22.0	146 24.3	12.8	58 16.8	23.6
	06	210 29.5	221 25.7	S 4 48.8	283 50.4	S23 21.8	161 26.7	N17 12.8	73 19.5	N17 23.7
	07	225 31.9	236 25.8	47.6	298 50.8	21.6	176 29.2	12.8	88 22.1	23.7
	08	240 34.4	251 26.0	46.4	313 51.2	21.4	191 31.6	12.9	103 24.8	23.8
F	09	255 36.9	266 26.1	·· 45.1	328 51.6	·· 21.2	206 34.0	·· 12.9	118 27.5	·· 23.9
R	10	270 39.3	281 26.3	43.9	343 52.0	21.0	221 36.4	12.9	133 30.1	23.9
I	11	285 41.8	296 26.5	42.7	358 52.4	20.8	236 38.8	12.9	148 32.8	24.0
D	12	300 44.3	311 26.6	S 4 41.4	13 52.8	S23 20.6	251 41.2	N17 12.9	163 35.4	N17 24.0
A	13	315 46.7	326 26.8	40.2	28 53.2	20.4	266 43.6	13.0	178 38.1	24.1
Y	14	330 49.2	341 27.0	39.0	43 53.6	20.2	281 46.1	13.0	193 40.7	24.2
	15	345 51.7	356 27.1	·· 37.7	58 54.0	·· 20.0	296 48.5	·· 13.0	208 43.4	·· 24.2
	16	0 54.1	11 27.3	36.5	73 54.5	19.8	311 50.9	13.0	223 46.1	24.3
	17	15 56.6	26 27.5	35.3	88 54.9	19.6	326 53.3	13.1	238 48.7	24.4
	18	30 59.0	41 27.6	S 4 34.0	103 55.3	S23 19.4	341 55.7	N17 13.1	253 51.4	N17 24.4
	19	46 01.5	56 27.8	32.8	118 55.7	19.2	356 58.1	13.1	268 54.0	24.5
	20	61 04.0	71 28.0	31.5	133 56.1	19.0	12 00.5	13.1	283 56.7	24.5
	21	76 06.4	86 28.1	·· 30.3	148 56.5	·· 18.8	27 02.9	·· 13.2	298 59.4	·· 24.6
	22	91 08.9	101 28.3	29.1	163 56.9	18.6	42 05.4	13.2	314 02.0	24.7
	23	106 11.4	116 28.5	27.8	178 57.3	18.4	57 07.8	13.2	329 04.7	24.7
	Mer. Pass.	h m 16 00.3	*v* 0.1	*d* 1.2	*v* 0.4	*d* 0.2	*v* 2.4	*d* 0.0	*v* 2.7	*d* 0.1

STARS		
Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 39.0	S40 24.1
Achernar	335 47.2	S57 21.5
Acrux	173 39.6	S62 58.1
Adhara	255 33.6	S28 56.7
Aldebaran	291 20.6	N16 27.8
Alioth	166 44.6	N56 04.7
Alkaid	153 20.5	N49 25.3
Al Na'ir	28 18.5	S47 04.4
Alnilam	276 13.9	S 1 13.1
Alphard	218 22.6	S 8 33.7
Alphecca	126 34.4	N26 47.3
Alpheratz	358 12.0	N28 58.0
Altair	62 35.2	N 8 48.5
Ankaa	353 42.9	S42 26.0
Antares	113 00.1	S26 22.8
Arcturus	146 20.7	N19 17.9
Atria	108 26.9	S68 58.9
Avior	234 28.5	S59 26.3
Bellatrix	279 01.1	N 6 19.6
Betelgeuse	271 30.6	N 7 24.1
Canopus	264 07.8	S52 41.2
Capella	281 14.5	N45 58.6
Deneb	49 50.6	N45 12.0
Denebola	183 01.4	N14 41.8
Diphda	349 23.4	S18 06.9
Dubhe	194 24.7	N61 52.2
Elnath	278 46.9	N28 35.3
Eltanin	90 59.3	N51 29.4
Enif	34 14.3	N 9 46.2
Fomalhaut	15 54.4	S29 44.7
Gacrux	172 31.2	S56 58.9
Gienah	176 20.3	S17 24.9
Hadar	149 26.7	S60 15.5
Hamal	328 31.6	N23 21.3
Kaus Aust.	84 20.5	S34 23.7
Kochab	137 19.3	N74 14.7
Markab	14 05.8	N15 05.0
Menkar	314 43.6	N 3 59.9
Menkent	148 39.9	S36 15.3
Miaplacidus	221 44.4	S69 37.4
Mirfak	309 19.3	N49 47.0
Nunki	76 32.6	S26 19.5
Peacock	54 02.9	S56 48.5
Pollux	244 00.8	N28 04.8
Procyon	245 28.0	N 5 16.9
Rasalhague	96 32.1	N12 34.6
Regulus	208 12.3	N12 04.6
Rigel	281 38.1	S 8 13.9
Rigil Kent.	140 29.2	S60 44.1
Sabik	102 44.2	S15 41.7
Schedar	350 11.9	N56 25.0
Shaula	96 59.4	S37 05.1
Sirius	258 57.5	S16 41.3
Spica	159 00.1	S11 02.5
Suhail	223 12.1	S43 20.5
Vega	80 57.9	N38 45.7
Zuben'ubi	137 35.8	S15 56.8

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	12 05.7	15 14
Mars	74 22.8	11 05
Jupiter	310 58.5	19 16
Saturn	222 44.2	1 12

	G.M.T.	SUN G.H.A.	SUN Dec.		MOON G.H.A.	v	MOON Dec.		d	H.P.
	d h	° ′	°	′	° ′	′	°	′	′	′
	19 00	177 20.4	S20	24.0	186 21.9	6.8	S16	54.0	5.8	59.2
	01	192 20.2		23.5	200 47.7	6.8	16	48.2	5.8	59.2
	02	207 20.0		23.0	215 13.5	7.0	16	42.4	6.0	59.2
	03	222 19.8	··	22.4	229 39.5	6.9	16	36.4	6.1	59.2
	04	237 19.6		21.9	244 05.4	7.0	16	30.3	6.2	59.1
	05	252 19.4		21.4	258 31.4	7.1	16	24.1	6.3	59.1
	06	267 19.2	S20	20.9	272 57.5	7.2	S16	17.8	6.4	59.1
W	07	282 19.1		20.3	287 23.7	7.2	16	11.4	6.5	59.1
E	08	297 18.9		19.8	301 49.9	7.3	16	04.9	6.6	59.0
D	09	312 18.7	··	19.3	316 16.2	7.4	15	58.3	6.6	59.0
N	10	327 18.5		18.8	330 42.6	7.4	15	51.7	6.8	59.0
E	11	342 18.3		18.2	345 09.0	7.5	15	44.9	6.9	59.0
S	12	357 18.1	S20	17.7	359 35.5	7.6	S15	38.0	6.9	59.0
D	13	12 17.9		17.2	14 02.1	7.6	15	31.1	7.1	58.9
A	14	27 17.7		16.7	28 28.7	7.7	15	24.0	7.1	58.9
Y	15	42 17.5	··	16.1	42 55.4	7.8	15	16.9	7.2	58.9
	16	57 17.3		15.6	57 22.2	7.8	15	09.7	7.3	58.9
	17	72 17.1		15.1	71 49.0	7.9	15	02.4	7.4	58.8
	18	87 17.0	S20	14.5	86 15.9	8.0	S14	55.0	7.5	58.8
	19	102 16.8		14.0	100 42.9	8.1	14	47.5	7.6	58.8
	20	117 16.6		13.5	115 10.0	8.1	14	39.9	7.6	58.8
	21	132 16.4	··	12.9	129 37.1	8.2	14	32.3	7.8	58.7
	22	147 16.2		12.4	144 04.3	8.3	14	24.5	7.8	58.7
	23	162 16.0		11.9	158 31.6	8.3	14	16.7	7.8	58.7
	20 00	177 15.8	S20	11.3	172 58.9	8.4	S14	08.9	8.0	58.7
	01	192 15.6		10.8	187 26.3	8.5	14	00.9	8.0	58.6
	02	207 15.5		10.3	201 53.8	8.6	13	52.9	8.2	58.6
	03	222 15.3	··	09.7	216 21.4	8.6	13	44.7	8.1	58.6
	04	237 15.1		09.2	230 49.0	8.7	13	36.6	8.3	58.5
	05	252 14.9		08.6	245 16.7	8.8	13	28.3	8.3	58.5
	06	267 14.7	S20	08.1	259 44.5	8.9	S13	20.0	8.4	58.5
	07	282 14.5		07.6	274 12.4	8.9	13	11.6	8.5	58.5
T	08	297 14.3		07.0	288 40.3	9.0	13	03.1	8.5	58.4
H	09	312 14.2	··	06.5	303 08.3	9.1	12	54.6	8.6	58.4
U	10	327 14.0		05.9	317 36.4	9.1	12	46.0	8.7	58.4
R	11	342 13.8		05.4	332 04.5	9.3	12	37.3	8.7	58.4
S	12	357 13.6	S20	04.8	346 32.8	9.3	S12	28.6	8.8	58.3
D	13	12 13.4		04.3	1 01.1	9.3	12	19.8	8.9	58.3
A	14	27 13.3		03.8	15 29.4	9.5	12	10.9	8.9	58.3
Y	15	42 13.1	··	03.2	29 57.9	9.5	12	02.0	8.9	58.2
	16	57 12.9		02.7	44 26.4	9.6	11	53.1	9.1	58.2
	17	72 12.7		02.1	58 55.0	9.7	11	44.0	9.0	58.2
	18	87 12.5	S20	01.6	73 23.7	9.7	S11	35.0	9.2	58.1
	19	102 12.3		01.0	87 52.4	9.8	11	25.8	9.2	58.1
	20	117 12.2	20	00.5	102 21.2	9.9	11	16.6	9.2	58.1
	21	132 12.0	19	59.9	116 50.1	9.9	11	07.4	9.3	58.1
	22	147 11.8		59.4	131 19.0	10.1	10	58.1	9.4	58.0
	23	162 11.6		58.8	145 48.1	10.1	10	48.7	9.4	58.0
	21 00	177 11.4	S19	58.3	160 17.2	10.1	S10	39.3	9.4	58.0
	01	192 11.3		57.7	174 46.3	10.3	10	29.9	9.5	57.9
	02	207 11.1		57.2	189 15.6	10.3	10	20.4	9.5	57.9
	03	222 10.9	··	56.6	203 44.9	10.3	10	10.9	9.6	57.9
	04	237 10.7		56.1	218 14.2	10.5	10	01.3	9.6	57.8
	05	252 10.6		55.5	232 43.7	10.5	9	51.7	9.7	57.8
	06	267 10.4	S19	54.9	247 13.2	10.6	S 9	42.0	9.7	57.8
	07	282 10.2		54.4	261 42.8	10.6	9	32.3	9.8	57.7
	08	297 10.0		53.8	276 12.4	10.8	9	22.5	9.8	57.7
F	09	312 09.8	··	53.3	290 42.2	10.8	9	12.7	9.8	57.7
R	10	327 09.7		52.7	305 12.0	10.8	9	02.9	9.8	57.7
I	11	342 09.5		52.2	319 41.8	10.9	8	53.1	9.9	57.6
D	12	357 09.3	S19	51.6	334 11.7	11.0	S 8	43.2	10.0	57.6
A	13	12 09.1		51.0	348 41.7	11.1	8	33.2	9.9	57.6
Y	14	27 09.0		50.5	3 11.8	11.1	8	23.3	10.0	57.5
	15	42 08.8	··	49.9	17 41.9	11.2	8	13.3	10.0	57.5
	16	57 08.6		49.4	32 12.1	11.2	8	03.3	10.1	57.5
	17	72 08.5		48.8	46 42.3	11.3	7	53.2	10.1	57.4
	18	87 08.3	S19	48.2	61 12.6	11.4	S 7	43.1	10.1	57.4
	19	102 08.1		47.7	75 43.0	11.5	7	33.0	10.1	57.4
	20	117 07.9		47.1	90 13.5	11.5	7	22.9	10.2	57.3
	21	132 07.8	··	46.5	104 44.0	11.5	7	12.7	10.2	57.3
	22	147 07.6		46.0	119 14.5	11.7	7	02.5	10.2	57.3
	23	162 07.4		45.4	133 45.2	11.6	6	52.3	10.2	57.2
		S.D. 16.3	*d*	0.5	S.D.	16.1		15.9		15.7

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 19	Moonrise 20	Moonrise 21	Moonrise 22
°	h m	h m	h m	h m	h m	h m	h m
N 72	07 48	09 31	▬	10 05	09 49	09 39	09 30
N 70	07 35	09 03	11 06	09 25	09 26	09 25	09 23
68	07 25	08 41	10 10	08 58	09 08	09 13	09 17
66	07 16	08 24	09 38	08 37	08 53	09 04	09 12
64	07 08	08 10	09 14	08 20	08 41	08 56	09 08
62	07 01	07 58	08 55	08 06	08 31	08 49	09 05
60	06 55	07 48	08 39	07 54	08 22	08 43	09 01
N 58	06 50	07 39	08 26	07 44	08 14	08 38	08 58
56	06 45	07 32	08 15	07 34	08 07	08 33	08 56
54	06 40	07 24	08 05	07 26	08 01	08 29	08 54
52	06 36	07 18	07 56	07 19	07 55	08 25	08 52
50	06 32	07 12	07 48	07 13	07 50	08 22	08 50
45	06 23	06 59	07 32	06 59	07 39	08 14	08 45
N 40	06 15	06 48	07 18	06 47	07 30	08 08	08 42
35	06 08	06 39	07 06	06 37	07 22	08 02	08 39
30	06 01	06 30	06 56	06 29	07 15	07 58	08 36
20	05 48	06 14	06 38	06 14	07 03	07 49	08 32
N 10	05 34	06 00	06 22	06 01	06 53	07 42	08 28
0	05 20	05 45	06 07	05 48	06 43	07 35	08 24
S 10	05 04	05 30	05 53	05 36	06 33	07 28	08 20
20	04 44	05 13	05 37	05 23	06 23	07 20	08 16
30	04 19	04 51	05 18	05 08	06 11	07 12	08 11
35	04 04	04 38	05 07	04 59	06 04	07 07	08 08
40	03 44	04 23	04 54	04 49	05 56	07 02	08 05
45	03 20	04 04	04 39	04 37	05 46	06 55	08 02
S 50	02 45	03 40	04 21	04 23	05 35	06 47	07 58
52	02 27	03 29	04 12	04 16	05 30	06 44	07 56
54	02 03	03 15	04 03	04 09	05 24	06 40	07 53
56	01 30	02 59	03 51	04 01	05 18	06 35	07 51
58	////	02 39	03 39	03 51	05 10	06 30	07 48
S 60	////	02 14	03 24	03 41	05 02	06 25	07 46

Lat.	Sunset	Twilight Civil	Twilight Naut.	Moonset 19	Moonset 20	Moonset 21	Moonset 22
°	h m	h m	h m	h m	h m	h m	h m
N 72	▬	14 52	16 35	14 11	16 20	18 16	20 04
N 70	13 17	15 21	16 48	14 50	16 42	18 28	20 09
68	14 13	15 42	16 58	15 17	16 59	18 38	20 13
66	14 45	15 59	17 07	15 37	17 12	18 46	20 16
64	15 09	16 13	17 15	15 53	17 23	18 52	20 19
62	15 28	16 24	17 22	16 07	17 33	18 58	20 21
60	15 43	16 35	17 28	16 18	17 41	19 03	20 23
N 58	15 56	16 43	17 33	16 28	17 48	19 08	20 25
56	16 08	16 51	17 38	16 36	17 54	19 11	20 26
54	16 18	16 58	17 42	16 44	18 00	19 15	20 28
52	16 26	17 05	17 47	16 51	18 05	19 18	20 29
50	16 34	17 11	17 50	16 57	18 09	19 21	20 30
45	16 51	17 23	17 59	17 10	18 19	19 27	20 33
N 40	17 05	17 34	18 07	17 21	18 27	19 32	20 35
35	17 16	17 44	18 15	17 30	18 34	19 37	20 37
30	17 27	17 52	18 22	17 38	18 40	19 41	20 39
20	17 44	18 08	18 35	17 52	18 51	19 47	20 41
N 10	18 00	18 22	18 48	18 04	19 00	19 53	20 44
0	18 15	18 37	19 02	18 15	19 08	19 59	20 46
S 10	18 30	18 52	19 18	18 26	19 17	20 04	20 48
20	18 45	19 09	19 38	18 38	19 26	20 10	20 51
30	19 04	19 30	20 02	18 51	19 36	20 16	20 53
35	19 15	19 43	20 18	18 59	19 41	20 20	20 55
40	19 27	19 58	20 37	19 08	19 48	20 24	20 57
45	19 42	20 17	21 02	19 18	19 56	20 29	20 59
S 50	20 00	20 41	21 35	19 30	20 05	20 34	21 01
52	20 09	20 52	21 54	19 36	20 09	20 37	21 02
54	20 19	21 06	22 16	19 42	20 14	20 40	21 03
56	20 29	21 22	22 48	19 49	20 19	20 43	21 05
58	20 42	21 41	////	19 57	20 24	20 47	21 06
S 60	20 57	22 05	////	20 06	20 31	20 51	21 08

Day	SUN Eqn. of Time 00ʰ	SUN Eqn. of Time 12ʰ	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	Age	Phase
	m s	m s	h m	h m	h m	d	
19	10 38	10 47	12 11	12 02	24 29	29	
20	10 56	11 05	12 11	12 56	00 29	01	●
21	11 14	11 22	12 11	13 47	01 22	02	

1977 JANUARY 22, 23, 24 (SAT., SUN., MON.)

	G.M.T.	ARIES	VENUS −4.1		MARS +1.5		JUPITER −2.1		SATURN +0.1		STARS		
		G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	Name	S.H.A.	Dec.
	d h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	° ′
	22 00	121 13.8	131 28.7	S 4 26.6	193 57.7	S23 18.2	72 10.2	N17 13.3	344 07.3	N17 24.8	Acamar	315 39.0	S40 24.1
	01	136 16.3	146 28.8	25.4	208 58.1	18.0	87 12.6	13.3	359 10.0	24.9	Achernar	335 47.2	S57 21.5
	02	151 18.8	161 29.0	24.1	223 58.5	17.8	102 15.0	13.3	14 12.7	24.9	Acrux	173 39.5	S62 58.1
	03	166 21.2	176 29.2	·· 22.9	238 58.9	·· 17.6	117 17.4	·· 13.3	29 15.3	·· 25.0	Adhara	255 33.6	S28 56.7
	04	181 23.7	191 29.4	21.7	253 59.3	17.4	132 19.8	13.4	44 18.0	25.0	Aldebaran	291 20.6	N16 27.8
	05	196 26.2	206 29.5	20.4	268 59.7	17.2	147 22.2	13.4	59 20.6	25.1			
	06	211 28.6	221 29.7	S 4 19.2	284 00.1	S23 17.0	162 24.6	N17 13.4	74 23.3	N17 25.2	Alioth	166 44.5	N56 04.7
	07	226 31.1	236 29.9	18.0	299 00.5	16.8	177 27.0	13.4	89 26.0	25.2	Alkaid	153 20.4	N49 25.3
S	08	241 33.5	251 30.1	16.7	314 00.9	16.6	192 29.5	13.5	104 28.6	25.3	Al Na'ir	28 18.5	S47 04.4
A	09	256 36.0	266 30.3	·· 15.5	329 01.3	·· 16.4	207 31.9	·· 13.5	119 31.3	·· 25.4	Alnilam	276 13.9	S 1 13.1
T	10	271 38.5	281 30.4	14.3	344 01.7	16.2	222 34.3	13.5	134 33.9	25.4	Alphard	218 22.6	S 8 33.7
U	11	286 40.9	296 30.6	13.0	359 02.1	15.9	237 36.7	13.5	149 36.6	25.5			
R	12	301 43.4	311 30.8	S 4 11.8	14 02.5	S23 15.7	252 39.1	N17 13.6	164 39.3	N17 25.5	Alphecca	126 34.3	N26 47.3
D	13	316 45.9	326 31.0	10.6	29 02.9	15.5	267 41.5	13.6	179 41.9	25.6	Alpheratz	358 12.0	N28 58.0
A	14	331 48.3	341 31.2	09.3	44 03.3	15.3	282 43.9	13.6	194 44.6	25.7	Altair	62 35.2	N 8 48.5
Y	15	346 50.8	356 31.4	·· 08.1	59 03.7	·· 15.1	297 46.3	·· 13.6	209 47.2	·· 25.7	Ankaa	353 42.9	S42 26.0
	16	1 53.3	11 31.6	06.9	74 04.1	14.9	312 48.7	13.7	224 49.9	25.8	Antares	113 00.1	S26 22.8
	17	16 55.7	26 31.7	05.6	89 04.5	14.7	327 51.1	13.7	239 52.6	25.9			
	18	31 58.2	41 31.9	S 4 04.4	104 04.9	S23 14.5	342 53.5	N17 13.7	254 55.2	N17 25.9	Arcturus	146 20.7	N19 17.9
	19	47 00.7	56 32.1	03.1	119 05.4	14.3	357 55.9	13.8	269 57.9	26.0	Atria	108 26.8	S68 58.9
	20	62 03.1	71 32.3	01.9	134 05.8	14.1	12 58.3	13.8	285 00.5	26.0	Avior	234 28.5	S59 26.3
	21	77 05.6	86 32.5	4 00.7	149 06.2	·· 13.8	28 00.7	·· 13.8	300 03.2	·· 26.1	Bellatrix	279 01.1	N 6 19.6
	22	92 08.0	101 32.7	3 59.4	164 06.6	13.6	43 03.1	13.8	315 05.9	26.2	Betelgeuse	271 30.6	N 7 24.1
	23	107 10.5	116 32.9	58.2	179 07.0	13.4	58 05.5	13.9	330 08.5	26.2			
	23 00	122 13.0	131 33.1	S 3 57.0	194 07.4	S23 13.2	73 07.9	N17 13.9	345 11.2	N17 26.3	Canopus	264 07.8	S52 41.3
	01	137 15.4	146 33.3	55.7	209 07.8	13.0	88 10.3	13.9	0 13.9	26.4	Capella	281 14.5	N45 58.6
	02	152 17.9	161 33.5	54.5	224 08.2	12.8	103 12.7	14.0	15 16.5	26.4	Deneb	49 50.6	N45 12.0
	03	167 20.4	176 33.7	·· 53.3	239 08.6	·· 12.6	118 15.1	·· 14.0	30 19.2	·· 26.5	Denebola	183 01.3	N14 41.8
	04	182 22.8	191 33.9	52.0	254 09.0	12.3	133 17.5	14.0	45 21.8	26.5	Diphda	349 23.5	S18 06.9
	05	197 25.3	206 34.1	50.8	269 09.4	12.1	148 19.9	14.0	60 24.5	26.6			
	06	212 27.8	221 34.3	S 3 49.6	284 09.8	S23 11.9	163 22.3	N17 14.1	75 27.2	N17 26.7	Dubhe	194 24.7	N61 52.2
	07	227 30.2	236 34.5	48.3	299 10.2	11.7	178 24.7	14.1	90 29.8	26.7	Elnath	278 46.9	N28 35.3
	08	242 32.7	251 34.7	47.1	314 10.6	11.5	193 27.1	14.1	105 32.5	26.8	Eltanin	90 59.3	N51 29.4
S	09	257 35.1	266 34.9	·· 45.8	329 11.0	·· 11.2	208 29.5	·· 14.2	120 35.1	·· 26.9	Enif	34 14.3	N 9 46.2
U	10	272 37.6	281 35.1	44.6	344 11.4	11.0	223 31.9	14.2	135 37.8	26.9	Fomalhaut	15 54.4	S29 44.7
N	11	287 40.1	296 35.3	43.4	359 11.8	10.8	238 34.3	14.2	150 40.5	27.0			
D	12	302 42.5	311 35.5	S 3 42.1	14 12.2	S23 10.6	253 36.7	N17 14.2	165 43.1	N17 27.0	Gacrux	172 31.1	S56 58.9
A	13	317 45.0	326 35.7	40.9	29 12.6	10.4	268 39.1	14.3	180 45.8	27.1	Gienah	176 20.3	S17 24.9
Y	14	332 47.5	341 35.9	39.7	44 13.0	10.1	283 41.5	14.3	195 48.5	27.2	Hadar	149 26.7	S60 15.5
	15	347 49.9	356 36.1	·· 38.4	59 13.4	·· 09.9	298 43.9	·· 14.3	210 51.1	·· 27.2	Hamal	328 31.6	N23 21.3
	16	2 52.4	11 36.3	37.2	74 13.9	09.7	313 46.3	14.4	225 53.8	27.3	Kaus Aust.	84 20.4	S34 23.7
	17	17 54.9	26 36.5	36.0	89 14.3	09.5	328 48.7	14.4	240 56.4	27.4			
	18	32 57.3	41 36.7	S 3 34.7	104 14.7	S23 09.3	343 51.1	N17 14.4	255 59.1	N17 27.4	Kochab	137 19.3	N74 14.7
	19	47 59.8	56 36.9	33.5	119 15.1	09.0	358 53.5	14.4	271 01.8	27.5	Markab	14 05.8	N15 05.0
	20	63 02.3	71 37.1	32.3	134 15.5	08.8	13 55.9	14.5	286 04.4	27.5	Menkar	314 43.6	N 3 59.9
	21	78 04.7	86 37.4	·· 31.0	149 15.9	·· 08.6	28 58.3	·· 14.5	301 07.1	·· 27.6	Menkent	148 39.8	S36 15.3
	22	93 07.2	101 37.6	29.8	164 16.3	08.4	44 00.7	14.5	316 09.8	27.7	Miaplacidus	221 44.4	S69 37.4
	23	108 09.6	116 37.8	28.5	179 16.7	08.1	59 03.1	14.6	331 12.4	27.7			
	24 00	123 12.1	131 38.0	S 3 27.3	194 17.1	S23 07.9	74 05.5	N17 14.6	346 15.1	N17 27.8	Mirfak	309 19.4	N49 47.0
	01	138 14.6	146 38.2	26.1	209 17.5	07.7	89 07.9	14.6	1 17.7	27.9	Nunki	76 32.5	S26 19.5
	02	153 17.0	161 38.4	24.8	224 17.9	07.5	104 10.2	14.7	16 20.4	27.9	Peacock	54 02.9	S56 48.5
	03	168 19.5	176 38.6	·· 23.6	239 18.3	·· 07.2	119 12.6	·· 14.7	31 23.1	·· 28.0	Pollux	244 00.8	N28 04.8
	04	183 22.0	191 38.9	22.4	254 18.7	07.0	134 15.0	14.7	46 25.7	28.0	Procyon	245 28.0	N 5 16.9
	05	198 24.4	206 39.1	21.1	269 19.1	06.8	149 17.4	14.7	61 28.4	28.1			
	06	213 26.9	221 39.3	S 3 19.9	284 19.5	S23 06.6	164 19.8	N17 14.8	76 31.1	N17 28.2	Rasalhague	96 32.1	N12 34.6
	07	228 29.4	236 39.5	18.7	299 19.9	06.3	179 22.2	14.8	91 33.7	28.2	Regulus	208 12.3	N12 04.6
	08	243 31.8	251 39.7	17.4	314 20.3	06.1	194 24.6	14.8	106 36.4	28.3	Rigel	281 38.1	S 8 13.9
M	09	258 34.3	266 40.0	·· 16.2	329 20.7	·· 05.9	209 27.0	·· 14.9	121 39.0	·· 28.4	Rigil Kent.	140 29.1	S60 44.1
O	10	273 36.8	281 40.2	15.0	344 21.2	05.6	224 29.4	14.9	136 41.7	28.4	Sabik	102 44.2	S15 41.8
N	11	288 39.2	296 40.4	13.7	359 21.6	05.4	239 31.8	14.9	151 44.4	28.5			
D	12	303 41.7	311 40.6	S 3 12.5	14 22.0	S23 05.2	254 34.2	N17 15.0	166 47.0	N17 28.5	Schedar	350 11.9	N56 25.0
A	13	318 44.1	326 40.9	11.2	29 22.4	05.0	269 36.5	15.0	181 49.7	28.6	Shaula	96 59.4	S37 05.1
Y	14	333 46.6	341 41.1	10.0	44 22.8	04.7	284 38.9	15.0	196 52.4	28.7	Sirius	258 57.5	S16 41.3
	15	348 49.1	356 41.3	·· 08.8	59 23.2	·· 04.5	299 41.3	·· 15.1	211 55.0	·· 28.7	Spica	159 00.0	S11 02.5
	16	3 51.5	11 41.5	07.5	74 23.6	04.3	314 43.7	15.1	226 57.7	28.8	Suhail	223 12.1	S43 20.5
	17	18 54.0	26 41.8	06.3	89 24.0	04.0	329 46.1	15.1	242 00.3	28.9			
	18	33 56.5	41 42.0	S 3 05.1	104 24.4	S23 03.8	344 48.5	N17 15.2	257 03.0	N17 28.9	Vega	80 57.9	N38 45.7
	19	48 58.9	56 42.2	03.8	119 24.8	03.6	359 50.9	15.2	272 05.7	29.0	Zuben'ubi	137 35.8	S15 56.8
	20	64 01.4	71 42.4	02.6	134 25.2	03.3	14 53.3	15.2	287 08.3	29.1		S.H.A.	Mer. Pass.
	21	79 03.9	86 42.7	·· 01.4	149 25.6	·· 03.1	29 55.6	·· 15.2	302 11.0	·· 29.1		° ′	h m
	22	94 06.3	101 42.9	3 00.1	164 26.0	02.9	44 58.0	15.3	317 13.7	29.2	Venus	9 20.1	15 14
	23	109 08.8	116 43.1	2 58.9	179 26.4	02.6	60 00.4	15.3	332 16.3	29.2	Mars	71 54.4	11 03
		h m									Jupiter	310 55.0	19 04
	Mer. Pass.	15 48.5	v 0.2	d 1.2	v 0.4	d 0.2	v 2.4	d 0.0	v 2.7	d 0.1	Saturn	222 58.2	0 59

1977 JANUARY 22, 23, 24 (SAT., SUN., MON.)

G.M.T.			SUN		MOON				
			G.H.A.	Dec.	G.H.A.	v	Dec.	d	H.P.
d	h		° ′	° ′	° ′	′	° ′	′	′
22	00		177 07.2	S19 44.8	148 15.8	11.8	S 6 42.1	10.3	57.2
	01		192 07.1	44.3	162 46.6	11.8	6 31.8	10.2	57.2
	02		207 06.9	43.7	177 17.4	11.9	6 21.6	10.3	57.1
	03		222 06.7	·· 43.1	191 48.3	11.9	6 11.3	10.4	57.1
	04		237 06.6	42.6	206 19.2	12.0	6 00.9	10.3	57.1
	05		252 06.4	42.0	220 50.2	12.0	5 50.6	10.3	57.0
	06		267 06.2	S19 41.4	235 21.2	12.1	S 5 40.3	10.4	57.0
	07		282 06.1	40.8	249 52.3	12.2	5 29.9	10.4	57.0
	08	S	297 05.9	40.3	264 23.5	12.2	5 19.5	10.4	57.0
	09	A	312 05.7	·· 39.7	278 54.7	12.2	5 09.1	10.4	56.9
	10	T	327 05.6	39.1	293 25.9	12.3	4 58.7	10.4	56.9
	11	U	342 05.4	38.6	307 57.2	12.4	4 48.3	10.4	56.9
	12	R	357 05.2	S19 38.0	322 28.6	12.4	S 4 37.9	10.4	56.8
	13	D	12 05.1	37.4	337 00.0	12.5	4 27.5	10.5	56.8
	14	A	27 04.9	36.8	351 31.5	12.5	4 17.0	10.4	56.8
	15	Y	42 04.7	·· 36.3	6 03.0	12.6	4 06.6	10.5	56.7
	16		57 04.6	35.7	20 34.6	12.6	3 56.1	10.4	56.7
	17		72 04.4	35.1	35 06.2	12.7	3 45.7	10.5	56.7
	18		87 04.2	S19 34.5	49 37.9	12.7	S 3 35.2	10.5	56.6
	19		102 04.1	33.9	64 09.6	12.8	3 24.7	10.5	56.6
	20		117 03.9	33.4	78 41.4	12.8	3 14.2	10.4	56.6
	21		132 03.7	·· 32.8	93 13.2	12.8	3 03.8	10.5	56.5
	22		147 03.6	32.2	107 45.0	13.0	2 53.3	10.5	56.5
	23		162 03.4	31.6	122 17.0	12.9	2 42.8	10.5	56.5
23	00		177 03.2	S19 31.0	136 48.9	13.0	S 2 32.3	10.5	56.4
	01		192 03.1	30.5	151 20.9	13.0	2 21.8	10.4	56.4
	02		207 02.9	29.9	165 52.9	13.1	2 11.4	10.5	56.4
	03		222 02.8	·· 29.3	180 25.0	13.1	2 00.9	10.5	56.4
	04		237 02.6	28.7	194 57.1	13.2	1 50.4	10.5	56.3
	05		252 02.4	28.1	209 29.3	13.2	1 39.9	10.4	56.3
	06		267 02.3	S19 27.5	224 01.5	13.3	S 1 29.5	10.5	56.3
	07		282 02.1	26.9	238 33.8	13.3	1 19.0	10.4	56.2
	08		297 02.0	26.4	253 06.1	13.3	1 08.6	10.5	56.2
	09	S	312 01.8	·· 25.8	267 38.4	13.3	0 58.1	10.4	56.2
	10	U	327 01.6	25.2	282 10.7	13.4	0 47.7	10.4	56.1
	11	N	342 01.5	24.6	296 43.1	13.5	0 37.3	10.5	56.1
	12	D	357 01.3	S19 24.0	311 15.6	13.5	S 0 26.8	10.4	56.1
	13	A	12 01.2	23.4	325 48.1	13.5	0 16.4	10.4	56.1
	14	Y	27 01.0	22.8	340 20.6	13.5	S 0 06.0	10.4	56.0
	15		42 00.8	·· 22.2	354 53.1	13.6	N 0 04.4	10.3	56.0
	16		57 00.7	21.6	9 25.7	13.6	0 14.7	10.4	56.0
	17		72 00.5	21.0	23 58.3	13.6	0 25.1	10.3	55.9
	18		87 00.4	S19 20.4	38 30.9	13.7	N 0 35.4	10.4	55.9
	19		102 00.2	19.9	53 03.6	13.7	0 45.8	10.3	55.9
	20		117 00.1	19.3	67 36.3	13.7	0 56.1	10.3	55.8
	21		131 59.9	·· 18.7	82 09.0	13.8	1 06.4	10.3	55.8
	22		146 59.8	18.1	96 41.8	13.8	1 16.7	10.2	55.8
	23		161 59.6	17.5	111 14.6	13.8	1 26.9	10.3	55.8
24	00		176 59.4	S19 16.9	125 47.4	13.8	N 1 37.2	10.2	55.7
	01		191 59.3	16.3	140 20.2	13.9	1 47.4	10.2	55.7
	02		206 59.1	15.7	154 53.1	13.9	1 57.6	10.2	55.7
	03		221 59.0	·· 15.1	169 26.0	13.9	2 07.8	10.2	55.7
	04		236 58.8	14.5	183 58.9	14.0	2 18.0	10.1	55.6
	05		251 58.7	13.9	198 31.9	13.9	2 28.1	10.2	55.6
	06		266 58.5	S19 13.3	213 04.8	14.0	N 2 38.3	10.1	55.6
	07		281 58.4	12.7	227 37.8	14.0	2 48.4	10.1	55.5
	08		296 58.2	12.1	242 10.8	14.1	2 58.5	10.0	55.5
	09	M	311 58.1	·· 11.5	256 43.9	14.0	3 08.5	10.1	55.5
	10	O	326 57.9	10.9	271 16.9	14.1	3 18.6	10.0	55.5
	11	N	341 57.8	10.3	285 50.0	14.1	3 28.6	10.0	55.4
	12	D	356 57.6	S19 09.7	300 23.1	14.1	N 3 38.6	9.9	55.4
	13	A	11 57.5	09.1	314 56.2	14.1	3 48.5	10.0	55.4
	14	Y	26 57.3	08.5	329 29.3	14.1	3 58.5	9.9	55.4
	15		41 57.2	·· 07.8	344 02.4	14.2	4 08.4	9.8	55.3
	16		56 57.0	07.2	358 35.6	14.2	4 18.2	9.9	55.3
	17		71 56.9	06.6	13 08.8	14.2	4 28.1	9.8	55.3
	18		86 56.7	S19 06.0	27 42.0	14.2	N 4 37.9	9.8	55.3
	19		101 56.6	05.4	42 15.2	14.2	4 47.7	9.8	55.2
	20		116 56.4	04.8	56 48.4	14.2	4 57.5	9.7	55.2
	21		131 56.3	·· 04.2	71 21.6	14.3	5 07.2	9.7	55.2
	22		146 56.1	03.6	85 54.9	14.2	5 16.9	9.7	55.2
	23		161 56.0	03.0	100 28.1	14.3	5 26.6	9.6	55.2
			S.D. 16.3	d 0.6	S.D. 15.5		15.3		15.1

Lat.	Twilight		Sunrise	Moonrise			
	Naut.	Civil		22	23	24	25
°	h m	h m	h m	h m	h m	h m	h m
N 72	07 39	09 18	■	09 30	09 23	09 15	09 08
N 70	07 28	08 53	10 41	09 23	09 21	09 20	09 18
68	07 18	08 33	09 57	09 17	09 20	09 23	09 26
66	07 10	08 17	09 28	09 12	09 19	09 26	09 33
64	07 03	08 04	09 06	09 08	09 19	09 28	09 39
62	06 57	07 53	08 48	09 05	09 18	09 31	09 44
60	06 51	07 44	08 34	09 01	09 17	09 32	09 48
N 58	06 46	07 35	08 21	08 58	09 17	09 34	09 52
56	06 42	07 28	08 11	08 56	09 16	09 36	09 55
54	06 37	07 21	08 01	08 54	09 16	09 37	09 58
52	06 33	07 15	07 53	08 52	09 15	09 38	10 01
50	06 30	07 09	07 45	08 50	09 15	09 39	10 04
45	06 21	06 57	07 29	08 45	09 14	09 42	10 10
N 40	06 14	06 47	07 16	08 42	09 14	09 44	10 14
35	06 07	06 38	07 05	08 39	09 13	09 46	10 18
30	06 00	06 29	06 55	08 36	09 13	09 47	10 22
20	05 47	06 14	06 38	08 32	09 12	09 50	10 28
N 10	05 35	06 00	06 23	08 28	09 11	09 53	10 34
0	05 21	05 46	06 08	08 24	09 10	09 55	10 39
S 10	05 05	05 32	05 54	08 20	09 10	09 58	10 45
20	04 47	05 15	05 38	08 16	09 09	10 00	10 50
30	04 23	04 54	05 21	08 11	09 08	10 03	10 57
35	04 07	04 42	05 10	08 08	09 08	10 05	11 01
40	03 49	04 27	04 58	08 05	09 07	10 07	11 05
45	03 25	04 09	04 44	08 02	09 06	10 09	11 10
S 50	02 52	03 46	04 26	07 58	09 06	10 12	11 16
52	02 35	03 35	04 18	07 56	09 05	10 13	11 19
54	02 13	03 22	04 08	07 53	09 05	10 15	11 22
56	01 44	03 07	03 58	07 51	09 05	10 16	11 25
58	00 54	02 48	03 46	07 48	09 04	10 18	11 29
S 60	////	02 25	03 32	07 46	09 04	10 20	11 33

Lat.	Sunset	Twilight		Moonset			
		Civil	Naut.	22	23	24	25
°	h m	h m	h m	h m	h m	h m	h m
N 72	■	15 07	16 46	20 04	21 47	23 27	25 06
N 70	13 43	15 32	16 57	20 09	21 45	23 19	24 51
68	14 28	15 52	17 07	20 13	21 44	23 12	24 39
66	14 57	16 07	17 15	20 16	21 43	23 07	24 29
64	15 19	16 20	17 22	20 19	21 42	23 02	24 21
62	15 36	16 31	17 28	20 21	21 41	22 58	24 14
60	15 51	16 41	17 33	20 23	21 40	22 55	24 08
N 58	16 03	16 49	17 38	20 25	21 40	22 52	24 03
56	16 14	16 57	17 43	20 26	21 39	22 49	23 58
54	16 23	17 03	17 47	20 28	21 39	22 47	23 54
52	16 31	17 09	17 51	20 29	21 38	22 45	23 50
50	16 39	17 15	17 55	20 30	21 38	22 43	23 46
45	16 55	17 27	18 03	20 33	21 37	22 39	23 39
N 40	17 08	17 37	18 10	20 35	21 36	22 35	23 33
35	17 19	17 47	18 17	20 37	21 35	22 32	23 27
30	17 29	17 55	18 24	20 39	21 35	22 29	23 22
20	17 46	18 10	18 36	20 41	21 34	22 24	23 14
N 10	18 01	18 24	18 49	20 44	21 33	22 20	23 07
0	18 16	18 37	19 03	20 46	21 32	22 16	23 00
S 10	18 30	18 52	19 18	20 48	21 31	22 13	22 54
20	18 45	19 09	19 37	20 51	21 30	22 08	22 47
30	19 03	19 29	20 01	20 53	21 29	22 04	22 39
35	19 13	19 42	20 16	20 55	21 28	22 01	22 34
40	19 25	19 56	20 34	20 57	21 28	21 58	22 29
45	19 39	20 14	20 58	20 59	21 27	21 54	22 23
S 50	19 57	20 37	21 30	21 01	21 26	21 50	22 15
52	20 05	20 48	21 47	21 02	21 25	21 48	22 12
54	20 14	21 00	22 08	21 03	21 25	21 46	22 08
56	20 25	21 15	22 36	21 05	21 24	21 44	22 04
58	20 37	21 33	23 21	21 06	21 24	21 41	22 00
S 60	20 51	21 56	////	21 08	21 23	21 38	21 55

Day	SUN			MOON			
	Eqn. of Time 00ʰ	Eqn. of Time 12ʰ	Mer. Pass.	Mer. Pass. Upper	Mer. Pass. Lower	Age	Phase
	m s	m s	h m	h m	h m	d	
22	11 31	11 39	12 12	14 35	02 11	03	☽
23	11 47	11 54	12 12	15 21	02 58	04	
24	12 02	12 09	12 12	16 06	03 44	05	

1977 JANUARY 25, 26, 27 (TUES., WED., THURS.)

	G.M.T.	ARIES	VENUS −4.1		MARS +1.5		JUPITER −2.1		SATURN +0.1	
		G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
	d h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
	25 00	124 11.2	131 43.4	S 2 57.6	194 26.8	S23 02.4	75 02.8	N17 15.3	347 19.0	N17 29.3
	01	139 13.7	146 43.6	56.4	209 27.3	02.2	90 05.2	15.4	2 21.7	29.4
	02	154 16.2	161 43.9	55.2	224 27.7	01.9	105 07.6	15.4	17 24.3	29.4
	03	169 18.6	176 44.1	·· 53.9	239 28.1	·· 01.7	120 09.9	·· 15.4	32 27.0	·· 29.5
	04	184 21.1	191 44.3	52.7	254 28.5	01.4	135 12.3	15.5	47 29.6	29.6
	05	199 23.6	206 44.6	51.5	269 28.9	01.2	150 14.7	15.5	62 32.3	29.6
	06	214 26.0	221 44.8	S 2 50.2	284 29.3	S23 01.0	165 17.1	N17 15.5	77 35.0	N17 29.7
	07	229 28.5	236 45.0	49.0	299 29.7	00.7	180 19.5	15.6	92 37.6	29.7
TUESDAY	08	244 31.0	251 45.3	47.8	314 30.1	00.5	195 21.9	15.6	107 40.3	29.8
	09	259 33.4	266 45.5	·· 46.5	329 30.5	·· 00.2	210 24.2	·· 15.6	122 43.0	·· 29.9
	10	274 35.9	281 45.8	45.3	344 30.9	23 00.0	225 26.6	15.7	137 45.6	29.9
	11	289 38.4	296 46.0	44.1	359 31.3	22 59.8	240 29.0	15.7	152 48.3	30.0
	12	304 40.8	311 46.3	S 2 42.8	14 31.7	S22 59.5	255 31.4	N17 15.7	167 51.0	N17 30.1
	13	319 43.3	326 46.5	41.6	29 32.1	59.3	270 33.8	15.8	182 53.6	30.1
	14	334 45.7	341 46.8	40.3	44 32.5	59.0	285 36.1	15.8	197 56.3	30.2
	15	349 48.2	356 47.0	·· 39.1	59 33.0	·· 58.8	300 38.5	·· 15.8	212 58.9	·· 30.2
	16	4 50.7	11 47.2	37.9	74 33.4	58.6	315 40.9	15.9	228 01.6	30.3
	17	19 53.1	26 47.5	36.6	89 33.8	58.3	330 43.3	15.9	243 04.3	30.4
	18	34 55.6	41 47.7	S 2 35.4	104 34.2	S22 58.1	345 45.7	N17 15.9	258 06.9	N17 30.4
	19	49 58.1	56 48.0	34.2	119 34.6	57.8	0 48.0	16.0	273 09.6	30.5
	20	65 00.5	71 48.2	32.9	134 35.0	57.6	15 50.4	16.0	288 12.3	30.6
	21	80 03.0	86 48.5	·· 31.7	149 35.4	·· 57.3	30 52.8	·· 16.0	303 14.9	·· 30.6
	22	95 05.5	101 48.8	30.5	164 35.8	57.1	45 55.2	16.1	318 17.6	30.7
	23	110 07.9	116 49.0	29.2	179 36.2	56.8	60 57.5	16.1	333 20.3	30.8
	26 00	125 10.4	131 49.3	S 2 28.0	194 36.6	S22 56.6	75 59.9	N17 16.1	348 22.9	N17 30.8
	01	140 12.9	146 49.5	26.8	209 37.0	56.4	91 02.3	16.2	3 25.6	30.9
	02	155 15.3	161 49.8	25.5	224 37.4	56.1	106 04.7	16.2	18 28.3	30.9
	03	170 17.8	176 50.0	·· 24.3	239 37.9	·· 55.9	121 07.0	·· 16.2	33 30.9	·· 31.0
	04	185 20.2	191 50.3	23.1	254 38.3	55.6	136 09.4	16.3	48 33.6	31.1
	05	200 22.7	206 50.5	21.8	269 38.7	55.4	151 11.8	16.3	63 36.2	31.1
	06	215 25.2	221 50.8	S 2 20.6	284 39.1	S22 55.1	166 14.2	N17 16.4	78 38.9	N17 31.2
WEDNESDAY	07	230 27.6	236 51.1	19.3	299 39.5	54.9	181 16.5	16.4	93 41.6	31.3
	08	245 30.1	251 51.3	18.1	314 39.9	54.6	196 18.9	16.4	108 44.2	31.3
	09	260 32.6	266 51.6	·· 16.9	329 40.3	·· 54.4	211 21.3	·· 16.5	123 46.9	·· 31.4
	10	275 35.0	281 51.9	15.6	344 40.7	54.1	226 23.7	16.5	138 49.6	31.4
	11	290 37.5	296 52.1	14.4	359 41.1	53.9	241 26.0	16.5	153 52.2	31.5
	12	305 40.0	311 52.4	S 2 13.2	14 41.5	S22 53.6	256 28.4	N17 16.6	168 54.9	N17 31.6
	13	320 42.4	326 52.7	11.9	29 41.9	53.4	271 30.8	16.6	183 57.6	31.6
	14	335 44.9	341 52.9	10.7	44 42.4	53.1	286 33.2	16.6	199 00.2	31.7
	15	350 47.4	356 53.2	·· 09.5	59 42.8	·· 52.9	301 35.5	·· 16.7	214 02.9	·· 31.8
	16	5 49.8	11 53.5	08.2	74 43.2	52.6	316 37.9	16.7	229 05.6	31.8
	17	20 52.3	26 53.7	07.0	89 43.6	52.3	331 40.3	16.7	244 08.2	31.9
	18	35 54.7	41 54.0	S 2 05.8	104 44.0	S22 52.1	346 42.6	N17 16.8	259 10.9	N17 31.9
	19	50 57.2	56 54.3	04.5	119 44.4	51.8	1 45.0	16.8	274 13.6	32.0
	20	65 59.7	71 54.5	03.3	134 44.8	51.6	16 47.4	16.8	289 16.2	32.1
	21	81 02.1	86 54.8	·· 02.1	149 45.2	·· 51.3	31 49.7	·· 16.9	304 18.9	·· 32.1
	22	96 04.6	101 55.1	2 00.8	164 45.6	51.1	46 52.1	16.9	319 21.6	32.2
	23	111 07.1	116 55.4	1 59.6	179 46.0	50.8	61 54.5	17.0	334 24.2	32.3
	27 00	126 09.5	131 55.6	S 1 58.4	194 46.4	S22 50.6	76 56.8	N17 17.0	349 26.9	N17 32.3
	01	141 12.0	146 55.9	57.1	209 46.9	50.3	91 59.2	17.0	4 29.6	32.4
	02	156 14.5	161 56.2	55.9	224 47.3	50.0	107 01.6	17.1	19 32.2	32.5
	03	171 16.9	176 56.5	·· 54.7	239 47.7	·· 49.8	122 03.9	·· 17.1	34 34.9	·· 32.5
	04	186 19.4	191 56.7	53.4	254 48.1	49.5	137 06.3	17.1	49 37.5	32.6
	05	201 21.8	206 57.0	52.2	269 48.5	49.3	152 08.7	17.2	64 40.2	32.6
	06	216 24.3	221 57.3	S 1 51.0	284 48.9	S22 49.0	167 11.0	N17 17.2	79 42.9	N17 32.7
	07	231 26.8	236 57.6	49.7	299 49.3	48.8	182 13.4	17.3	94 45.5	32.8
THURSDAY	08	246 29.2	251 57.9	48.5	314 49.7	48.5	197 15.8	17.3	109 48.2	32.8
	09	261 31.7	266 58.2	·· 47.3	329 50.1	·· 48.2	212 18.1	·· 17.3	124 50.9	·· 32.9
	10	276 34.2	281 58.4	46.0	344 50.5	48.0	227 20.5	17.4	139 53.5	33.0
	11	291 36.6	296 58.7	44.8	359 51.0	47.7	242 22.9	17.4	154 56.2	33.0
	12	306 39.1	311 59.0	S 1 43.6	14 51.4	S22 47.4	257 25.2	N17 17.4	169 58.9	N17 33.1
	13	321 41.6	326 59.3	42.3	29 51.8	47.2	272 27.6	17.5	185 01.5	33.1
	14	336 44.0	341 59.6	41.1	44 52.2	46.9	287 30.0	17.5	200 04.2	33.2
	15	351 46.5	356 59.9	·· 39.9	59 52.6	·· 46.7	302 32.3	·· 17.6	215 06.9	·· 33.3
	16	6 49.0	12 00.2	38.6	74 53.0	46.4	317 34.7	17.6	230 09.5	33.3
	17	21 51.4	27 00.5	37.4	89 53.4	46.1	332 37.0	17.6	245 12.2	33.4
	18	36 53.9	42 00.8	S 1 36.2	104 53.8	S22 45.9	347 39.4	N17 17.7	260 14.9	N17 33.5
	19	51 56.3	57 01.0	34.9	119 54.2	45.6	2 41.8	17.7	275 17.5	33.5
	20	66 58.8	72 01.3	33.7	134 54.7	45.3	17 44.1	17.7	290 20.2	33.6
	21	82 01.3	87 01.6	·· 32.5	149 55.1	·· 45.1	32 46.5	·· 17.8	305 22.9	·· 33.7
	22	97 03.7	102 01.9	31.2	164 55.5	44.8	47 48.9	17.8	320 25.5	33.7
	23	112 06.2	117 02.2	30.0	179 55.9	44.5	62 51.2	17.9	335 28.2	33.8
	Mer. Pass.	h m 15 36.7	*v* 0.3	*d* 1.2	*v* 0.4	*d* 0.3	*v* 2.4	*d* 0.0	*v* 2.7	*d* 0.1

STARS		
Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 39.0	S40 24.1
Achernar	335 47.3	S57 21.5
Acrux	173 39.5	S62 58.2
Adhara	255 33.7	S28 56.7
Aldebaran	291 20.6	N16 27.8
Alioth	166 44.5	N56 04.7
Alkaid	153 20.4	N49 25.3
Al Na'ir	28 18.5	S47 04.4
Alnilam	276 13.9	S 1 13.1
Alphard	218 22.6	S 8 33.7
Alphecca	126 34.3	N26 47.3
Alpheratz	358 12.0	N28 58.0
Altair	62 35.2	N 8 48.5
Ankaa	353 42.9	S42 26.0
Antares	113 00.0	S26 22.8
Arcturus	146 20.7	N19 17.9
Atria	108 26.8	S68 58.9
Avior	234 28.5	S59 26.3
Bellatrix	279 01.1	N 6 19.6
Betelgeuse	271 30.6	N 7 24.0
Canopus	264 07.8	S52 41.3
Capella	281 14.5	N45 58.6
Deneb	49 50.6	N45 12.0
Denebola	183 01.3	N14 41.8
Diphda	349 23.5	S18 06.9
Dubhe	194 24.7	N61 52.2
Elnath	278 46.9	N28 35.3
Eltanin	90 59.3	N51 29.4
Enif	34 14.3	N 9 46.2
Fomalhaut	15 54.4	S29 44.7
Gacrux	172 31.1	S56 58.9
Gienah	176 20.3	S17 24.9
Hadar	149 26.7	S60 15.5
Hamal	328 31.7	N23 21.3
Kaus Aust.	84 20.4	S34 23.6
Kochab	137 19.2	N74 14.7
Markab	14 05.8	N15 05.0
Menkar	314 43.6	N 3 59.9
Menkent	148 39.8	S36 15.3
Miaplacidus	221 44.4	S69 37.4
Mirfak	309 19.4	N49 47.0
Nunki	76 32.5	S26 19.5
Peacock	54 02.9	S56 48.5
Pollux	244 00.8	N28 04.8
Procyon	245 28.0	N 5 16.9
Rasalhague	96 32.1	N12 34.5
Regulus	208 12.3	N12 04.6
Rigel	281 38.1	S 8 13.9
Rigil Kent.	140 29.1	S60 44.1
Sabik	102 44.2	S15 41.8
Schedar	350 11.9	N56 25.0
Shaula	96 59.4	S37 05.1
Sirius	258 57.5	S16 41.3
Spica	159 00.0	S11 02.6
Suhail	223 12.1	S43 20.5
Vega	80 57.9	N38 45.7
Zuben'ubi	137 35.8	S15 56.8

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	6 38.9	15 12
Mars	69 26.2	11 01
Jupiter	310 49.5	18 53
Saturn	223 12.5	0 46

	G.M.T.	SUN		MOON				
		G.H.A.	Dec.	G.H.A.	v	Dec.	d	H.P.
	d h	° ′	° ′	° ′	′	° ′	′	′
	25 00	176 55.8	S19 02.4	115 01.4	14.2	N 5 36.2	9.6	55.1
	01	191 55.7	01.7	129 34.6	14.3	5 45.8	9.6	55.1
	02	206 55.5	01.1	144 07.9	14.3	5 55.4	9.5	55.1
	03	221 55.4	19 00.5	158 41.2	14.3	6 04.9	9.5	55.1
	04	236 55.3	18 59.9	173 14.5	14.3	6 14.4	9.5	55.0
	05	251 55.1	59.3	187 47.8	14.3	6 23.9	9.4	55.0
	06	266 55.0	S18 58.7	202 21.1	14.3	N 6 33.3	9.4	55.0
	07	281 54.8	58.1	216 54.4	14.4	6 42.7	9.4	55.0
T	08	296 54.7	57.4	231 27.8	14.3	6 52.1	9.3	55.0
U	09	311 54.5	·· 56.8	246 01.1	14.3	7 01.4	9.3	54.9
E	10	326 54.4	56.2	260 34.4	14.3	7 10.7	9.2	54.9
S	11	341 54.3	55.6	275 07.7	14.4	7 19.9	9.2	54.9
D	12	356 54.1	S18 55.0	289 41.1	14.3	N 7 29.1	9.2	54.9
A	13	11 54.0	54.4	304 14.4	14.4	7 38.3	9.1	54.9
Y	14	26 53.8	53.7	318 47.8	14.3	7 47.4	9.1	54.8
	15	41 53.7	·· 53.1	333 21.1	14.3	7 56.5	9.0	54.8
	16	56 53.5	52.5	347 54.4	14.4	8 05.5	9.1	54.8
	17	71 53.4	51.9	2 27.8	14.3	8 14.6	8.9	54.8
	18	86 53.3	S18 51.2	17 01.1	14.3	N 8 23.5	8.9	54.8
	19	101 53.1	50.6	31 34.4	14.4	8 32.4	8.9	54.7
	20	116 53.0	50.0	46 07.8	14.3	8 41.3	8.9	54.7
	21	131 52.9	·· 49.4	60 41.1	14.3	8 50.2	8.8	54.7
	22	146 52.7	48.8	75 14.4	14.3	8 59.0	8.7	54.7
	23	161 52.6	48.1	89 47.7	14.4	9 07.7	8.7	54.7
	26 00	176 52.4	S18 47.5	104 21.1	14.3	N 9 16.4	8.7	54.7
	01	191 52.3	46.9	118 54.4	14.3	9 25.1	8.6	54.6
	02	206 52.2	46.2	133 27.7	14.3	9 33.7	8.6	54.6
	03	221 52.0	·· 45.6	148 01.0	14.3	9 42.3	8.5	54.6
	04	236 51.9	45.0	162 34.3	14.2	9 50.8	8.5	54.6
	05	251 51.8	44.4	177 07.5	14.3	9 59.3	8.4	54.6
	06	266 51.6	S18 43.7	191 40.8	14.3	N10 07.7	8.4	54.6
W	07	281 51.5	43.1	206 14.1	14.2	10 16.1	8.3	54.6
E	08	296 51.3	42.5	220 47.3	14.3	10 24.4	8.3	54.5
D	09	311 51.2	·· 41.8	235 20.6	14.2	10 32.7	8.2	54.5
N	10	326 51.1	41.2	249 53.8	14.2	10 40.9	8.2	54.5
E	11	341 50.9	40.6	264 27.0	14.2	10 49.1	8.1	54.5
S	12	356 50.8	S18 39.9	279 00.2	14.2	N10 57.2	8.1	54.5
D	13	11 50.7	39.3	293 33.4	14.2	11 05.3	8.1	54.5
A	14	26 50.5	38.7	308 06.6	14.2	11 13.4	7.9	54.5
Y	15	41 50.4	·· 38.0	322 39.8	14.1	11 21.3	8.0	54.5
	16	56 50.3	37.4	337 12.9	14.2	11 29.3	7.9	54.4
	17	71 50.2	36.8	351 46.1	14.1	11 37.2	7.8	54.4
	18	86 50.0	S18 36.1	6 19.2	14.1	N11 45.0	7.8	54.4
	19	101 49.9	35.5	20 52.3	14.1	11 52.8	7.7	54.4
	20	116 49.8	34.9	35 25.4	14.1	12 00.5	7.6	54.4
	21	131 49.6	·· 34.2	49 58.5	14.0	12 08.1	7.6	54.4
	22	146 49.5	33.6	64 31.5	14.1	12 15.7	7.6	54.4
	23	161 49.4	32.9	79 04.6	14.0	12 23.3	7.5	54.4
	27 00	176 49.2	S18 32.3	93 37.6	14.0	N12 30.8	7.4	54.4
	01	191 49.1	31.7	108 10.6	14.0	12 38.2	7.4	54.4
	02	206 49.0	31.0	122 43.6	14.0	12 45.6	7.4	54.3
	03	221 48.9	·· 30.4	137 16.6	13.9	12 53.0	7.2	54.3
	04	236 48.7	29.7	151 49.5	14.0	13 00.2	7.3	54.3
	05	251 48.6	29.1	166 22.5	13.9	13 07.5	7.1	54.3
	06	266 48.5	S18 28.4	180 55.4	13.9	N13 14.6	7.1	54.3
	07	281 48.3	27.8	195 28.3	13.8	13 21.7	7.1	54.3
T	08	296 48.2	27.2	210 01.1	13.9	13 28.8	6.9	54.3
H	09	311 48.1	·· 26.5	224 34.0	13.8	13 35.7	7.0	54.3
U	10	326 48.0	25.9	239 06.8	13.8	13 42.7	6.8	54.3
R	11	341 47.8	25.2	253 39.6	13.8	13 49.5	6.8	54.3
S	12	356 47.7	S18 24.6	268 12.4	13.7	N13 56.3	6.8	54.3
D	13	11 47.6	23.9	282 45.1	13.8	14 03.1	6.6	54.3
A	14	26 47.5	23.3	297 17.9	13.7	14 09.7	6.6	54.3
Y	15	41 47.3	·· 22.6	311 50.6	13.6	14 16.3	6.6	54.3
	16	56 47.2	22.0	326 23.2	13.7	14 22.9	6.5	54.3
	17	71 47.1	21.3	340 55.9	13.6	14 29.4	6.4	54.2
	18	86 47.0	S18 20.7	355 28.5	13.6	N14 35.8	6.4	54.2
	19	101 46.9	20.0	10 01.1	13.6	14 42.2	6.3	54.2
	20	116 46.7	19.4	24 33.7	13.6	14 48.5	6.2	54.2
	21	131 46.6	·· 18.7	39 06.3	13.5	14 54.7	6.2	54.2
	22	146 46.5	18.1	53 38.8	13.5	15 00.9	6.1	54.2
	23	161 46.4	17.4	68 11.3	13.5	15 07.0	6.0	54.2
		S.D. 16.3	d 0.6	S.D. 15.0		14.8		14.8

Lat.	Twilight		Sunrise	Moonrise			
	Naut.	Civil		25	26	27	28
°	h m	h m	h m	h m	h m	h m	h m
N 72	07 30	09 05	11 41	09 08	09 00	08 51	08 39
N 70	07 20	08 42	10 21	09 18	09 17	09 17	09 18
68	07 11	08 24	09 44	09 26	09 30	09 36	09 46
66	07 04	08 10	09 18	09 33	09 41	09 52	10 06
64	06 57	07 58	08 57	09 39	09 50	10 05	10 23
62	06 52	07 47	08 41	09 44	09 58	10 15	10 37
60	06 47	07 38	08 28	09 48	10 05	10 25	10 49
N 58	06 42	07 31	08 16	09 52	10 11	10 33	10 59
56	06 38	07 24	08 06	09 55	10 16	10 40	11 08
54	06 34	07 17	07 57	09 58	10 21	10 47	11 16
52	06 30	07 12	07 49	10 01	10 26	10 52	11 23
50	06 27	07 06	07 42	10 04	10 30	10 58	11 29
45	06 19	06 55	07 27	10 10	10 38	11 09	11 43
N 40	06 12	06 45	07 14	10 14	10 45	11 19	11 55
35	06 06	06 36	07 03	10 18	10 52	11 27	12 04
30	05 59	06 28	06 54	10 22	10 57	11 34	12 13
20	05 47	06 14	06 37	10 28	11 07	11 46	12 28
N 10	05 35	06 01	06 23	10 34	11 15	11 57	12 41
0	05 22	05 47	06 09	10 39	11 23	12 08	12 53
S 10	05 07	05 33	05 55	10 45	11 31	12 18	13 06
20	04 49	05 17	05 40	10 50	11 40	12 29	13 19
30	04 26	04 57	05 23	10 57	11 50	12 42	13 34
35	04 11	04 45	05 13	11 01	11 55	12 49	13 43
40	03 53	04 31	05 02	11 05	12 02	12 58	13 53
45	03 30	04 14	04 48	11 10	12 10	13 08	14 05
S 50	02 59	03 52	04 31	11 16	12 19	13 20	14 19
52	02 43	03 41	04 23	11 19	12 23	13 25	14 26
54	02 23	03 29	04 14	11 22	12 28	13 32	14 33
56	01 58	03 15	04 04	11 25	12 33	13 38	14 42
58	01 19	02 58	03 53	11 29	12 39	13 46	14 51
S 60	////	02 36	03 40	11 33	12 45	13 55	15 02

Lat.	Sunset	Twilight		Moonset			
		Civil	Naut.	25	26	27	28
°	h m	h m	h m	h m	h m	h m	h m
N 72	12 46	15 21	16 56	25 06	01 06	02 47	04 34
N 70	14 05	15 44	17 07	24 51	00 51	02 23	03 55
68	14 42	16 02	17 15	24 39	00 39	02 04	03 28
66	15 09	16 16	17 23	24 29	00 29	01 50	03 08
64	15 29	16 28	17 29	24 21	00 21	01 38	02 52
62	15 45	16 39	17 34	24 14	00 14	01 27	02 39
60	15 58	16 48	17 39	24 08	00 08	01 19	02 27
N 58	16 10	16 55	17 44	24 03	00 03	01 11	02 17
56	16 20	17 02	17 48	23 58	25 04	01 04	02 09
54	16 29	17 09	17 52	23 54	24 58	00 58	02 01
52	16 37	17 14	17 56	23 50	24 53	00 53	01 55
50	16 44	17 20	17 59	23 46	24 48	00 48	01 48
45	16 59	17 31	18 07	23 39	24 38	00 38	01 35
N 40	17 12	17 41	18 14	23 33	24 29	00 29	01 24
35	17 23	17 49	18 20	23 27	24 22	00 22	01 15
30	17 32	17 57	18 26	23 22	24 15	00 15	01 07
20	17 48	18 11	18 38	23 14	24 04	00 04	00 53
N 10	18 03	18 25	18 50	23 07	23 54	24 41	00 41
0	18 16	18 38	19 03	23 00	23 45	24 30	00 30
S 10	18 30	18 52	19 18	22 54	23 35	24 18	00 18
20	18 45	19 08	19 36	22 47	23 26	24 06	00 06
30	19 02	19 28	19 59	22 39	23 14	23 52	24 33
35	19 12	19 40	20 14	22 34	23 08	23 44	24 24
40	19 23	19 54	20 31	22 29	23 01	23 35	24 13
45	19 37	20 11	20 54	22 23	22 52	23 25	24 01
S 50	19 53	20 32	21 24	22 15	22 42	23 12	23 46
52	20 01	20 43	21 40	22 12	22 37	23 06	23 39
54	20 10	20 55	21 59	22 08	22 32	22 59	23 31
56	20 20	21 09	22 24	22 04	22 26	22 52	23 22
58	20 31	21 26	23 01	22 00	22 20	22 44	23 12
S 60	20 44	21 46	////	21 55	22 13	22 34	23 01

Day	SUN			MOON			
	Eqn. of Time 00ʰ	Eqn. of Time 12ʰ	Mer. Pass.	Mer. Pass. Upper	Mer. Pass. Lower	Age	Phase
	m s	m s	h m	h m	h m	d	
25	12 16	12 23	12 12	16 50	04 28	06	
26	12 30	12 36	12 13	17 34	05 12	07	◐
27	12 43	12 49	12 13	18 19	05 56	08	

1977 JANUARY 28, 29, 30 (FRI., SAT., SUN.)

G.M.T.	ARIES G.H.A.	VENUS −4.1 G.H.A.	VENUS Dec.	MARS +1.5 G.H.A.	MARS Dec.	JUPITER −2.1 G.H.A.	JUPITER Dec.	SATURN +0.1 G.H.A.	SATURN Dec.
d h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
28 00	127 08.7	132 02.5	S 1 28.8	194 56.3	S22 44.3	77 53.6	N17 17.9	350 30.9	N17 33.8
01	142 11.1	147 02.8	27.5	209 56.7	44.0	92 55.9	17.9	5 33.5	33.9
02	157 13.6	162 03.1	26.3	224 57.1	43.7	107 58.3	18.0	20 36.2	34.0
03	172 16.1	177 03.4	·· 25.1	239 57.5	·· 43.5	123 00.6	·· 18.0	35 38.9	·· 34.0
04	187 18.5	192 03.7	23.8	254 58.0	43.2	138 03.0	18.0	50 41.5	34.1
05	202 21.0	207 04.0	22.6	269 58.4	42.9	153 05.4	18.1	65 44.2	34.2
06	217 23.5	222 04.3	S 1 21.4	284 58.8	S22 42.7	168 07.7	N17 18.1	80 46.9	N17 34.2
07	232 25.9	237 04.6	20.1	299 59.2	42.4	183 10.1	18.2	95 49.5	34.3
08	247 28.4	252 04.9	18.9	314 59.6	42.1	198 12.4	18.2	110 52.2	34.3
F 09	262 30.8	267 05.2	·· 17.7	330 00.0	·· 41.8	213 14.8	·· 18.2	125 54.9	·· 34.4
R 10	277 33.3	282 05.5	16.5	345 00.4	41.6	228 17.1	18.3	140 57.5	34.5
I 11	292 35.8	297 05.8	15.2	0 00.8	41.3	243 19.5	18.3	156 00.2	34.5
D 12	307 38.2	312 06.2	S 1 14.0	15 01.2	S22 41.0	258 21.9	N17 18.4	171 02.9	N17 34.6
A 13	322 40.7	327 06.5	12.8	30 01.7	40.8	273 24.2	18.4	186 05.5	34.7
Y 14	337 43.2	342 06.8	11.5	45 02.1	40.5	288 26.6	18.4	201 08.2	34.7
15	352 45.6	357 07.1	·· 10.3	60 02.5	·· 40.2	303 28.9	·· 18.5	216 10.9	·· 34.8
16	7 48.1	12 07.4	09.1	75 02.9	39.9	318 31.3	18.5	231 13.5	34.9
17	22 50.6	27 07.7	07.8	90 03.3	39.7	333 33.6	18.6	246 16.2	34.9
18	37 53.0	42 08.0	S 1 06.6	105 03.7	S22 39.4	348 36.0	N17 18.6	261 18.9	N17 35.0
19	52 55.5	57 08.3	05.4	120 04.1	39.1	3 38.3	18.6	276 21.5	35.0
20	67 57.9	72 08.6	04.1	135 04.6	38.8	18 40.7	18.7	291 24.2	35.1
21	83 00.4	87 09.0	·· 02.9	150 05.0	·· 38.6	33 43.0	·· 18.7	306 26.9	·· 35.2
22	98 02.9	102 09.3	01.7	165 05.4	38.3	48 45.4	18.8	321 29.5	35.2
23	113 05.3	117 09.6	1 00.5	180 05.8	38.0	63 47.7	18.8	336 32.2	35.3
29 00	128 07.8	132 09.9	S 0 59.2	195 06.2	S22 37.7	78 50.1	N17 18.8	351 34.9	N17 35.4
01	143 10.3	147 10.2	58.0	210 06.6	37.4	93 52.4	18.9	6 37.5	35.4
02	158 12.7	162 10.6	56.8	225 07.0	37.2	108 54.8	18.9	21 40.2	35.5
03	173 15.2	177 10.9	·· 55.5	240 07.4	·· 36.9	123 57.1	·· 19.0	36 42.9	·· 35.5
04	188 17.7	192 11.2	54.3	255 07.9	36.6	138 59.5	19.0	51 45.5	35.6
05	203 20.1	207 11.5	53.1	270 08.3	36.3	154 01.8	19.0	66 48.2	35.7
06	218 22.6	222 11.8	S 0 51.8	285 08.7	S22 36.1	169 04.2	N17 19.1	81 50.9	N17 35.7
07	233 25.1	237 12.2	50.6	300 09.1	35.8	184 06.5	19.1	96 53.5	35.8
S 08	248 27.5	252 12.5	49.4	315 09.5	35.5	199 08.9	19.2	111 56.2	35.9
A 09	263 30.0	267 12.8	·· 48.2	330 09.9	·· 35.2	214 11.2	·· 19.2	126 58.9	·· 35.9
T 10	278 32.4	282 13.2	46.9	345 10.3	34.9	229 13.6	19.3	142 01.5	36.0
U 11	293 34.9	297 13.5	45.7	0 10.8	34.6	244 15.9	19.3	157 04.2	36.1
R 12	308 37.4	312 13.8	S 0 44.5	15 11.2	S22 34.4	259 18.3	N17 19.3	172 06.9	N17 36.1
D 13	323 39.8	327 14.1	43.2	30 11.6	34.1	274 20.6	19.4	187 09.5	36.2
A 14	338 42.3	342 14.5	42.0	45 12.0	33.8	289 23.0	19.4	202 12.2	36.2
Y 15	353 44.8	357 14.8	·· 40.8	60 12.4	·· 33.5	304 25.3	·· 19.5	217 14.9	·· 36.3
16	8 47.2	12 15.1	39.6	75 12.8	33.2	319 27.7	19.5	232 17.5	36.4
17	23 49.7	27 15.5	38.3	90 13.2	32.9	334 30.0	19.5	247 20.2	36.4
18	38 52.2	42 15.8	S 0 37.1	105 13.7	S22 32.7	349 32.4	N17 19.6	262 22.9	N17 36.5
19	53 54.6	57 16.1	35.9	120 14.1	32.4	4 34.7	19.6	277 25.5	36.6
20	68 57.1	72 16.5	34.6	135 14.5	32.1	19 37.0	19.7	292 28.2	36.6
21	83 59.6	87 16.8	·· 33.4	150 14.9	·· 31.8	34 39.4	·· 19.7	307 30.9	·· 36.7
22	99 02.0	102 17.2	32.2	165 15.3	31.5	49 41.7	19.8	322 33.5	36.7
23	114 04.5	117 17.5	31.0	180 15.7	31.2	64 44.1	19.8	337 36.2	36.8
30 00	129 06.9	132 17.8	S 0 29.7	195 16.1	S22 30.9	79 46.4	N17 19.8	352 38.9	N17 36.9
01	144 09.4	147 18.2	28.5	210 16.6	30.6	94 48.8	19.9	7 41.5	36.9
02	159 11.9	162 18.5	27.3	225 17.0	30.4	109 51.1	19.9	22 44.2	37.0
03	174 14.3	177 18.9	·· 26.1	240 17.4	·· 30.1	124 53.4	·· 20.0	37 46.9	·· 37.1
04	189 16.8	192 19.2	24.8	255 17.8	29.8	139 55.8	20.0	52 49.5	37.1
05	204 19.3	207 19.6	23.6	270 18.2	29.5	154 58.1	20.1	67 52.2	37.2
06	219 21.7	222 19.9	S 0 22.4	285 18.6	S22 29.2	170 00.5	N17 20.1	82 54.9	N17 37.2
07	234 24.2	237 20.2	21.2	300 19.1	28.9	185 02.8	20.1	97 57.5	37.3
08	249 26.7	252 20.6	19.9	315 19.5	28.6	200 05.1	20.2	113 00.2	37.4
S 09	264 29.1	267 20.9	·· 18.7	330 19.9	·· 28.3	215 07.5	·· 20.2	128 02.9	·· 37.4
U 10	279 31.6	282 21.3	17.5	345 20.3	28.0	230 09.8	20.3	143 05.5	37.5
N 11	294 34.0	297 21.6	16.3	0 20.7	27.7	245 12.2	20.3	158 08.2	37.6
D 12	309 36.5	312 22.0	S 0 15.0	15 21.1	S22 27.4	260 14.5	N17 20.4	173 10.9	N17 37.6
A 13	324 39.0	327 22.3	13.8	30 21.6	27.2	275 16.8	20.4	188 13.6	37.7
Y 14	339 41.4	342 22.7	12.6	45 22.0	26.9	290 19.2	20.5	203 16.2	37.8
15	354 43.9	357 23.1	·· 11.4	60 22.4	·· 26.6	305 21.5	·· 20.5	218 18.9	·· 37.8
16	9 46.4	12 23.4	10.1	75 22.8	26.3	320 23.9	20.5	233 21.6	37.9
17	24 48.8	27 23.8	08.9	90 23.2	26.0	335 26.2	20.6	248 24.2	37.9
18	39 51.3	42 24.1	S 0 07.7	105 23.6	S22 25.7	350 28.5	N17 20.6	263 26.9	N17 38.0
19	54 53.8	57 24.5	06.5	120 24.1	25.4	5 30.9	20.7	278 29.6	38.1
20	69 56.2	72 24.8	05.2	135 24.5	25.1	20 33.2	20.7	293 32.2	38.1
21	84 58.7	87 25.2	·· 04.0	150 24.9	·· 24.8	35 35.5	·· 20.8	308 34.9	·· 38.2
22	100 01.2	102 25.6	02.8	165 25.3	24.5	50 37.9	20.8	323 37.6	38.3
23	115 03.6	117 25.9	01.6	180 25.7	24.2	65 40.2	20.8	338 40.2	38.3
Mer. Pass.	h m 15 24.9	*v* 0.3	*d* 1.2	*v* 0.4	*d* 0.3	*v* 2.3	*d* 0.0	*v* 2.7	*d* 0.1

STARS

Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 39.1	S40 24.1
Achernar	335 47.3	S57 21.5
Acrux	173 39.5	S62 58.2
Adhara	255 33.7	S28 56.7
Aldebaran	291 20.6	N16 27.8
Alioth	166 44.5	N56 04.7
Alkaid	153 20.4	N49 25.3
Al Na'ir	28 18.5	S47 04.4
Alnilam	276 13.9	S 1 13.2
Alphard	218 22.6	S 8 33.7
Alphecca	126 34.3	N26 47.3
Alpheratz	358 12.0	N28 58.0
Altair	62 35.2	N 8 48.5
Ankaa	353 42.9	S42 26.0
Antares	113 00.0	S26 22.8
Arcturus	146 20.7	N19 17.9
Atria	108 26.7	S68 58.9
Avior	234 28.5	S59 26.3
Bellatrix	279 01.1	N 6 19.6
Betelgeuse	271 30.6	N 7 24.0
Canopus	264 07.8	S52 41.3
Capella	281 14.6	N45 58.6
Deneb	49 50.5	N45 12.0
Denebola	183 01.3	N14 41.8
Diphda	349 23.5	S18 06.9
Dubhe	194 24.7	N61 52.2
Elnath	278 46.9	N28 35.3
Eltanin	90 59.3	N51 29.4
Enif	34 14.3	N 9 46.2
Fomalhaut	15 54.4	S29 44.7
Gacrux	172 31.1	S56 58.9
Gienah	176 20.3	S17 24.9
Hadar	149 26.6	S60 15.5
Hamal	328 31.7	N23 21.3
Kaus Aust.	84 20.4	S34 23.6
Kochab	137 19.2	N74 14.7
Markab	14 05.8	N15 05.0
Menkar	314 43.6	N 3 59.9
Menkent	148 39.8	S36 15.3
Miaplacidus	221 44.4	S69 37.5
Mirfak	309 19.4	N49 47.0
Nunki	76 32.5	S26 19.5
Peacock	54 02.9	S56 48.5
Pollux	244 00.8	N28 04.8
Procyon	245 28.0	N 5 16.9
Rasalhague	96 32.1	N12 34.5
Regulus	208 12.3	N12 04.6
Rigel	281 38.1	S 8 13.9
Rigil Kent.	140 29.0	S60 44.1
Sabik	102 44.1	S15 41.8
Schedar	350 12.0	N56 25.0
Shaula	96 59.3	S37 05.1
Sirius	258 57.5	S16 41.3
Spica	159 00.0	S11 02.6
Suhail	223 12.1	S43 20.5
Vega	80 57.8	N38 45.7
Zuben'ubi	137 35.7	S15 56.8

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	4 02.1	15 11
Mars	66 58.4	10 59
Jupiter	310 42.3	18 42
Saturn	223 27.1	0 34

	G.M.T.	SUN G.H.A.	SUN Dec.	MOON G.H.A.	MOON v	MOON Dec.	MOON d	MOON H.P.
	d h	° ′	° ′	° ′	′	° ′	′	′
	28 00	176 46.3	S18 16.8	82 43.8	13.4	N15 13.0	6.0	54.2
	01	191 46.1	16.1	97 16.2	13.4	15 19.0	5.9	54.2
	02	206 46.0	15.4	111 48.6	13.4	15 24.9	5.8	54.2
	03	221 45.9	·· 14.8	126 21.0	13.4	15 30.7	5.8	54.2
	04	236 45.8	14.1	140 53.4	13.3	15 36.5	5.7	54.2
	05	251 45.7	13.5	155 25.7	13.3	15 42.2	5.6	54.2
	06	266 45.5	S18 12.8	169 58.0	13.3	N15 47.8	5.6	54.2
	07	281 45.4	12.2	184 30.3	13.2	15 53.4	5.5	54.2
	08	296 45.3	11.5	199 02.5	13.2	15 58.9	5.4	54.2
F	09	311 45.2	·· 10.8	213 34.7	13.2	16 04.3	5.3	54.2
R	10	326 45.1	10.2	228 06.9	13.2	16 09.6	5.3	54.2
I	11	341 44.9	09.5	242 39.1	13.1	16 14.9	5.2	54.2
D	12	356 44.8	S18 08.9	257 11.2	13.1	N16 20.1	5.2	54.2
A	13	11 44.7	08.2	271 43.3	13.1	16 25.3	5.0	54.2
Y	14	26 44.6	07.5	286 15.4	13.0	16 30.3	5.0	54.2
	15	41 44.5	·· 06.9	300 47.4	13.0	16 35.3	5.0	54.2
	16	56 44.4	06.2	315 19.4	13.0	16 40.3	4.8	54.2
	17	71 44.3	05.5	329 51.4	12.9	16 45.1	4.8	54.2
	18	86 44.1	S18 04.9	344 23.3	12.9	N16 49.9	4.7	54.2
	19	101 44.0	04.2	358 55.2	12.9	16 54.6	4.6	54.3
	20	116 43.9	03.6	13 27.1	12.9	16 59.2	4.6	54.3
	21	131 43.8	·· 02.9	27 59.0	12.8	17 03.8	4.4	54.3
	22	146 43.7	02.2	42 30.8	12.8	17 08.2	4.4	54.3
	23	161 43.6	01.6	57 02.6	12.7	17 12.6	4.4	54.3
	29 00	176 43.5	S18 00.9	71 34.3	12.7	N17 17.0	4.2	54.3
	01	191 43.4	18 00.2	86 06.0	12.7	17 21.2	4.2	54.3
	02	206 43.2	17 59.6	100 37.7	12.7	17 25.4	4.1	54.3
	03	221 43.1	·· 58.9	115 09.4	12.6	17 29.5	4.0	54.3
	04	236 43.0	58.2	129 41.0	12.6	17 33.5	3.9	54.3
	05	251 42.9	57.5	144 12.6	12.6	17 37.4	3.9	54.3
	06	266 42.8	S17 56.9	158 44.2	12.5	N17 41.3	3.7	54.3
	07	281 42.7	56.2	173 15.7	12.5	17 45.0	3.7	54.3
S	08	296 42.6	55.5	187 47.2	12.4	17 48.7	3.7	54.3
A	09	311 42.5	·· 54.9	202 18.6	12.5	17 52.4	3.5	54.3
T	10	326 42.4	54.2	216 50.1	12.4	17 55.9	3.5	54.3
U	11	341 42.3	53.5	231 21.5	12.4	17 59.4	3.3	54.4
R	12	356 42.2	S17 52.8	245 52.9	12.3	N18 02.7	3.3	54.4
D	13	11 42.0	52.2	260 24.2	12.3	18 06.0	3.2	54.4
A	14	26 41.9	51.5	274 55.5	12.3	18 09.2	3.2	54.4
Y	15	41 41.8	·· 50.8	289 26.8	12.2	18 12.4	3.0	54.4
	16	56 41.7	50.1	303 58.0	12.2	18 15.4	3.0	54.4
	17	71 41.6	49.5	318 29.2	12.2	18 18.4	2.9	54.4
	18	86 41.5	S17 48.8	333 00.4	12.1	N18 21.3	2.8	54.4
	19	101 41.4	48.1	347 31.5	12.2	18 24.1	2.7	54.4
	20	116 41.3	47.4	2 02.7	12.0	18 26.8	2.6	54.4
	21	131 41.2	·· 46.7	16 33.7	12.1	18 29.4	2.6	54.5
	22	146 41.1	46.1	31 04.8	12.0	18 32.0	2.4	54.5
	23	161 41.0	45.4	45 35.8	12.0	18 34.4	2.4	54.5
	30 00	176 40.9	S17 44.7	60 06.8	12.0	N18 36.8	2.3	54.5
	01	191 40.8	44.0	74 37.8	11.9	18 39.1	2.2	54.5
	02	206 40.7	43.3	89 08.7	11.9	18 41.3	2.1	54.5
	03	221 40.6	·· 42.7	103 39.6	11.9	18 43.4	2.0	54.5
	04	236 40.5	42.0	118 10.5	11.8	18 45.4	2.0	54.5
	05	251 40.4	41.3	132 41.3	11.8	18 47.4	1.8	54.6
	06	266 40.3	S17 40.6	147 12.1	11.8	N18 49.2	1.8	54.6
	07	281 40.2	39.9	161 42.9	11.7	18 51.0	1.7	54.6
	08	296 40.1	39.2	176 13.6	11.8	18 52.7	1.6	54.6
S	09	311 40.0	·· 38.5	190 44.4	11.7	18 54.3	1.5	54.6
U	10	326 39.9	37.9	205 15.1	11.6	18 55.8	1.4	54.6
N	11	341 39.8	37.2	219 45.7	11.7	18 57.2	1.3	54.6
D	12	356 39.7	S17 36.5	234 16.4	11.6	N18 58.5	1.2	54.6
A	13	11 39.6	35.8	248 47.0	11.5	18 59.7	1.2	54.7
Y	14	26 39.5	35.1	263 17.5	11.6	19 00.9	1.0	54.7
	15	41 39.4	·· 34.4	277 48.1	11.5	19 01.9	1.0	54.7
	16	56 39.3	33.7	292 18.6	11.5	19 02.9	0.9	54.7
	17	71 39.2	33.0	306 49.1	11.5	19 03.8	0.8	54.7
	18	86 39.1	S17 32.3	321 19.6	11.4	N19 04.6	0.7	54.7
	19	101 39.0	31.7	335 50.0	11.4	19 05.3	0.6	54.8
	20	116 38.9	31.0	350 20.4	11.4	19 05.9	0.5	54.8
	21	131 38.8	·· 30.3	4 50.8	11.4	19 06.4	0.4	54.8
	22	146 38.7	29.6	19 21.2	11.3	19 06.8	0.3	54.8
	23	161 38.6	28.9	33 51.5	11.4	19 07.1	0.2	54.8
		S.D. 16.3	*d* 0.7	S.D. 14.8		14.8		14.9

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 28	Moonrise 29	Moonrise 30	Moonrise 31
°	h m	h m	h m	h m	h m	h m	h m
N 72	07 20	08 52	10 56	08 39	08 10	☐	☐
N 70	07 11	08 31	10 03	09 18	09 24	09 40	10 24
68	07 03	08 15	09 31	09 46	10 02	10 29	11 16
66	06 57	08 02	09 07	10 06	10 28	11 01	11 48
64	06 51	07 51	08 49	10 23	10 49	11 24	12 12
62	06 46	07 41	08 34	10 37	11 05	11 42	12 31
60	06 42	07 33	08 21	10 49	11 19	11 58	12 46
N 58	06 37	07 26	08 10	10 59	11 31	12 11	12 59
56	06 34	07 19	08 01	11 08	11 41	12 22	13 11
54	06 30	07 13	07 52	11 16	11 50	12 32	13 21
52	06 27	07 08	07 45	11 23	11 59	12 40	13 29
50	06 24	07 03	07 38	11 29	12 06	12 48	13 37
45	06 17	06 52	07 23	11 43	12 22	13 05	13 54
N 40	06 10	06 43	07 11	11 55	12 35	13 19	14 08
35	06 04	06 34	07 01	12 04	12 46	13 31	14 20
30	05 58	06 27	06 52	12 13	12 55	13 41	14 30
20	05 47	06 13	06 36	12 28	13 12	13 58	14 48
N 10	05 35	06 01	06 23	12 41	13 26	14 14	15 03
0	05 23	05 48	06 10	12 53	13 40	14 28	15 17
S 10	05 08	05 34	05 56	13 06	13 54	14 43	15 32
20	04 51	05 19	05 42	13 19	14 08	14 58	15 47
30	04 29	05 00	05 26	13 34	14 25	15 16	16 05
35	04 15	04 48	05 16	13 43	14 35	15 26	16 15
40	03 58	04 35	05 05	13 53	14 46	15 38	16 27
45	03 36	04 18	04 52	14 05	15 00	15 52	16 41
S 50	03 07	03 58	04 36	14 19	15 16	16 09	16 58
52	02 52	03 47	04 29	14 26	15 23	16 17	17 06
54	02 33	03 36	04 20	14 33	15 32	16 26	17 14
56	02 10	03 23	04 11	14 42	15 41	16 36	17 24
58	01 38	03 07	04 00	14 51	15 52	16 48	17 36
S 60	////	02 47	03 48	15 02	16 05	17 01	17 49

Lat.	Sunset	Twilight Civil	Twilight Naut.	Moonset 28	Moonset 29	Moonset 30	Moonset 31
°	h m	h m	h m	h m	h m	h m	h m
N 72	13 31	15 35	17 08	04 34	06 39	☐	☐
N 70	14 25	15 56	17 17	03 55	05 25	06 48	07 46
68	14 57	16 12	17 24	03 28	04 48	05 59	06 54
66	15 20	16 26	17 31	03 08	04 22	05 28	06 22
64	15 38	16 37	17 36	02 52	04 02	05 05	05 58
62	15 53	16 46	17 41	02 39	03 46	04 47	05 39
60	16 06	16 54	17 46	02 27	03 32	04 32	05 24
N 58	16 17	17 02	17 50	02 17	03 21	04 19	05 11
56	16 26	17 08	17 54	02 09	03 10	04 08	04 59
54	16 35	17 14	17 57	02 01	03 02	03 58	04 49
52	16 42	17 19	18 00	01 55	02 54	03 49	04 40
50	16 49	17 24	18 03	01 48	02 46	03 41	04 32
45	17 03	17 35	18 10	01 35	02 31	03 25	04 15
N 40	17 15	17 44	18 17	01 24	02 19	03 11	04 02
35	17 26	17 52	18 23	01 15	02 08	03 00	03 50
30	17 35	18 00	18 29	01 07	01 59	02 50	03 39
20	17 50	18 13	18 40	00 53	01 43	02 32	03 22
N 10	18 04	18 26	18 51	00 41	01 29	02 17	03 06
0	18 17	18 38	19 04	00 30	01 16	02 03	02 52
S 10	18 30	18 52	19 18	00 18	01 03	01 49	02 37
20	18 44	19 07	19 35	00 06	00 49	01 34	02 22
30	19 00	19 26	19 57	24 33	00 33	01 17	02 04
35	19 10	19 37	20 11	24 24	00 24	01 06	01 54
40	19 21	19 51	20 28	24 13	00 13	00 55	01 42
45	19 33	20 07	20 49	24 01	00 01	00 41	01 28
S 50	19 49	20 28	21 18	23 46	24 25	00 25	01 11
52	19 57	20 38	21 33	23 39	24 17	00 17	01 02
54	20 05	20 49	21 51	23 31	24 09	00 09	00 53
56	20 14	21 02	22 13	23 22	23 59	24 43	00 43
58	20 25	21 18	22 44	23 12	23 48	24 32	00 32
S 60	20 37	21 36	23 42	23 01	23 35	24 18	00 18

Day	SUN Eqn. of Time 00ʰ	SUN Eqn. of Time 12ʰ	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
	m s	m s	h m	h m	h m	d	
28	12 55	13 00	12 13	19 04	06 41	09	◐
29	13 06	13 11	12 13	19 52	07 28	10	
30	13 16	13 21	12 13	20 40	08 16	11	

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G.M.T.		ARIES	VENUS −4.1		MARS +1.5		JUPITER −2.0		SATURN +0.1	
		G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
d	h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
31	00	130 06.1	132 26.3	S 0 00.3	195 26.1	S22 23.9	80 42.5	N17 20.9	353 42.9	N17 38.4
	01	145 08.5	147 26.7	N 0 00.9	210 26.6	23.6	95 44.9	20.9	8 45.6	38.4
	02	160 11.0	162 27.0	02.1	225 27.0	23.3	110 47.2	21.0	23 48.2	38.5
	03	175 13.5	177 27.4	·· 03.3	240 27.4	·· 23.0	125 49.5	·· 21.0	38 50.9	·· 38.6
	04	190 15.9	192 27.8	04.6	255 27.8	22.7	140 51.9	21.1	53 53.6	38.6
	05	205 18.4	207 28.1	05.8	270 28.2	22.4	155 54.2	21.1	68 56.2	38.7
	06	220 20.9	222 28.5	N 0 07.0	285 28.6	S22 22.1	170 56.5	N17 21.2	83 58.9	N17 38.8
	07	235 23.3	237 28.9	08.2	300 29.1	21.8	185 58.9	21.2	99 01.6	38.8
	08	250 25.8	252 29.2	09.4	315 29.5	21.5	201 01.2	21.3	114 04.2	38.9
M	09	265 28.3	267 29.6	·· 10.7	330 29.9	·· 21.2	216 03.5	·· 21.3	129 06.9	·· 39.0
O	10	280 30.7	282 30.0	11.9	345 30.3	20.9	231 05.9	21.3	144 09.6	39.0
N	11	295 33.2	297 30.3	13.1	0 30.7	20.6	246 08.2	21.4	159 12.2	39.1
D	12	310 35.7	312 30.7	N 0 14.3	15 31.1	S22 20.3	261 10.5	N17 21.4	174 14.9	N17 39.1
A	13	325 38.1	327 31.1	15.6	30 31.6	20.0	276 12.9	21.5	189 17.6	39.2
Y	14	340 40.6	342 31.5	16.8	45 32.0	19.7	291 15.2	21.5	204 20.2	39.3
	15	355 43.0	357 31.8	·· 18.0	60 32.4	·· 19.4	306 17.5	·· 21.6	219 22.9	·· 39.3
	16	10 45.5	12 32.2	19.2	75 32.8	19.1	321 19.9	21.6	234 25.6	39.4
	17	25 48.0	27 32.6	20.4	90 33.2	18.8	336 22.2	21.7	249 28.3	39.5
	18	40 50.4	42 33.0	N 0 21.7	105 33.7	S22 18.5	351 24.5	N17 21.7	264 30.9	N17 39.5
	19	55 52.9	57 33.4	22.9	120 34.1	18.1	6 26.8	21.8	279 33.6	39.6
	20	70 55.4	72 33.7	24.1	135 34.5	17.8	21 29.2	21.8	294 36.3	39.6
	21	85 57.8	87 34.1	·· 25.3	150 34.9	·· 17.5	36 31.5	·· 21.9	309 38.9	·· 39.7
	22	101 00.3	102 34.5	26.5	165 35.3	17.2	51 33.8	21.9	324 41.6	39.8
	23	116 02.8	117 34.9	27.8	180 35.8	16.9	66 36.1	21.9	339 44.3	39.8
1	00	131 05.2	132 35.3	N 0 29.0	195 36.2	S22 16.6	81 38.5	N17 22.0	354 46.9	N17 39.9
	01	146 07.7	147 35.7	30.2	210 36.6	16.3	96 40.8	22.0	9 49.6	40.0
	02	161 10.1	162 36.1	31.4	225 37.0	16.0	111 43.1	22.1	24 52.3	40.0
	03	176 12.6	177 36.4	·· 32.6	240 37.4	·· 15.7	126 45.4	·· 22.1	39 54.9	·· 40.1
	04	191 15.1	192 36.8	33.9	255 37.9	15.4	141 47.8	22.2	54 57.6	40.1
	05	206 17.5	207 37.2	35.1	270 38.3	15.1	156 50.1	22.2	70 00.3	40.2
	06	221 20.0	222 37.6	N 0 36.3	285 38.7	S22 14.7	171 52.4	N17 22.3	85 02.9	N17 40.3
	07	236 22.5	237 38.0	37.5	300 39.1	14.4	186 54.7	22.3	100 05.6	40.3
T	08	251 24.9	252 38.4	38.7	315 39.5	14.1	201 57.1	22.4	115 08.3	40.4
U	09	266 27.4	267 38.8	·· 39.9	330 40.0	·· 13.8	216 59.4	·· 22.4	130 10.9	·· 40.5
E	10	281 29.9	282 39.2	41.2	345 40.4	13.5	232 01.7	22.5	145 13.6	40.5
S	11	296 32.3	297 39.6	42.4	0 40.8	13.2	247 04.0	22.5	160 16.3	40.6
D	12	311 34.8	312 40.0	N 0 43.6	15 41.2	S22 12.9	262 06.4	N17 22.6	175 18.9	N17 40.6
A	13	326 37.3	327 40.4	44.8	30 41.6	12.6	277 08.7	22.6	190 21.6	40.7
Y	14	341 39.7	342 40.8	46.0	45 42.1	12.2	292 11.0	22.7	205 24.3	40.8
	15	356 42.2	357 41.2	·· 47.3	60 42.5	·· 11.9	307 13.3	·· 22.7	220 27.0	·· 40.8
	16	11 44.6	12 41.6	48.5	75 42.9	11.6	322 15.6	22.7	235 29.6	40.9
	17	26 47.1	27 42.0	49.7	90 43.3	11.3	337 18.0	22.8	250 32.3	41.0
	18	41 49.6	42 42.4	N 0 50.9	105 43.7	S22 11.0	352 20.3	N17 22.8	265 35.0	N17 41.0
	19	56 52.0	57 42.8	52.1	120 44.2	10.7	7 22.6	22.9	280 37.6	41.1
	20	71 54.5	72 43.2	53.3	135 44.6	10.3	22 24.9	22.9	295 40.3	41.2
	21	86 57.0	87 43.6	·· 54.5	150 45.0	·· 10.0	37 27.2	·· 23.0	310 43.0	·· 41.2
	22	101 59.4	102 44.0	55.8	165 45.4	09.7	52 29.6	23.0	325 45.6	41.3
	23	117 01.9	117 44.4	57.0	180 45.8	09.4	67 31.9	23.1	340 48.3	41.3
2	00	132 04.4	132 44.8	N 0 58.2	195 46.3	S22 09.1	82 34.2	N17 23.1	355 51.0	N17 41.4
	01	147 06.8	147 45.2	0 59.4	210 46.7	08.8	97 36.5	23.2	10 53.6	41.5
	02	162 09.3	162 45.7	1 00.6	225 47.1	08.4	112 38.8	23.2	25 56.3	41.5
	03	177 11.8	177 46.1	·· 01.8	240 47.5	·· 08.1	127 41.2	·· 23.3	40 59.0	·· 41.6
	04	192 14.2	192 46.5	03.0	255 48.0	07.8	142 43.5	23.3	56 01.6	41.7
	05	207 16.7	207 46.9	04.3	270 48.4	07.5	157 45.8	23.4	71 04.3	41.7
	06	222 19.1	222 47.3	N 1 05.5	285 48.8	S22 07.2	172 48.1	N17 23.4	86 07.0	N17 41.8
W	07	237 21.6	237 47.7	06.7	300 49.2	06.8	187 50.4	23.5	101 09.6	41.8
E	08	252 24.1	252 48.1	07.9	315 49.6	06.5	202 52.7	23.5	116 12.3	41.9
D	09	267 26.5	267 48.6	·· 09.1	330 50.1	·· 06.2	217 55.1	·· 23.6	131 15.0	·· 42.0
N	10	282 29.0	282 49.0	10.3	345 50.5	05.9	232 57.4	23.6	146 17.7	42.0
E	11	297 31.5	297 49.4	11.5	0 50.9	05.5	247 59.7	23.7	161 20.3	42.1
S	12	312 33.9	312 49.8	N 1 12.8	15 51.3	S22 05.2	263 02.0	N17 23.7	176 23.0	N17 42.2
D	13	327 36.4	327 50.2	14.0	30 51.8	04.9	278 04.3	23.8	191 25.7	42.2
A	14	342 38.9	342 50.7	15.2	45 52.2	04.6	293 06.6	23.8	206 28.3	42.3
Y	15	357 41.3	357 51.1	·· 16.4	60 52.6	·· 04.2	308 08.9	·· 23.9	221 31.0	·· 42.3
	16	12 43.8	12 51.5	17.6	75 53.0	03.9	323 11.3	23.9	236 33.7	42.4
	17	27 46.2	27 51.9	18.8	90 53.5	03.6	338 13.6	24.0	251 36.3	42.5
	18	42 48.7	42 52.4	N 1 20.0	105 53.9	S22 03.3	353 15.9	N17 24.0	266 39.0	N17 42.5
	19	57 51.2	57 52.8	21.2	120 54.3	02.9	8 18.2	24.1	281 41.7	42.6
	20	72 53.6	72 53.2	22.4	135 54.7	02.6	23 20.5	24.1	296 44.3	42.7
	21	87 56.1	87 53.7	·· 23.7	150 55.1	·· 02.3	38 22.8	·· 24.2	311 47.0	·· 42.7
	22	102 58.6	102 54.1	24.9	165 55.6	02.0	53 25.1	24.2	326 49.7	42.8
	23	118 01.0	117 54.5	26.1	180 56.0	01.6	68 27.4	24.3	341 52.3	42.8
Mer. Pass.		h m 15 13.2	*v* 0.4	*d* 1.2	*v* 0.4	*d* 0.3	*v* 2.3	*d* 0.0	*v* 2.7	*d* 0.1

STARS

Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 39.1	S40 24.1
Achernar	335 47.3	S57 21.5
Acrux	173 39.4	S62 58.2
Adhara	255 33.7	S28 56.7
Aldebaran	291 20.6	N16 27.8
Alioth	166 44.4	N56 04.7
Alkaid	153 20.3	N49 25.3
Al Na'ir	28 18.5	S47 04.4
Alnilam	276 13.9	S 1 13.2
Alphard	218 22.6	S 8 33.7
Alphecca	126 34.3	N26 47.3
Alpheratz	358 12.0	N28 57.9
Altair	62 35.2	N 8 48.5
Ankaa	353 42.9	S42 26.0
Antares	113 00.0	S26 22.8
Arcturus	146 20.6	N19 17.9
Atria	108 26.7	S68 58.9
Avior	234 28.5	S59 26.3
Bellatrix	279 01.1	N 6 19.6
Betelgeuse	271 30.6	N 7 24.0
Canopus	264 07.8	S52 41.3
Capella	281 14.6	N45 58.6
Deneb	49 50.5	N45 12.0
Denebola	183 01.3	N14 41.8
Diphda	349 23.5	S18 06.9
Dubhe	194 24.6	N61 52.2
Elnath	278 46.9	N28 35.3
Eltanin	90 59.3	N51 29.4
Enif	34 14.3	N 9 46.2
Fomalhaut	15 54.4	S29 44.7
Gacrux	172 31.0	S56 59.0
Gienah	176 20.2	S17 25.0
Hadar	149 26.6	S60 15.5
Hamal	328 31.7	N23 21.3
Kaus Aust.	84 20.4	S34 23.6
Kochab	137 19.1	N74 14.7
Markab	14 05.8	N15 05.0
Menkar	314 43.6	N 3 59.9
Menkent	148 39.8	S36 15.3
Miaplacidus	221 44.4	S69 37.5
Mirfak	309 19.4	N49 47.0
Nunki	76 32.5	S26 19.5
Peacock	54 02.8	S56 48.5
Pollux	244 00.8	N28 04.8
Procyon	245 28.0	N 5 16.9
Rasalhague	96 32.1	N12 34.5
Regulus	208 12.3	N12 04.5
Rigel	281 38.1	S 8 13.9
Rigil Kent.	140 29.0	S60 44.1
Sabik	102 44.1	S15 41.8
Schedar	350 12.0	N56 24.9
Shaula	96 59.3	S37 05.1
Sirius	258 57.5	S16 41.3
Spica	159 00.0	S11 02.6
Suhail	223 12.1	S43 20.6
Vega	80 57.8	N38 45.7
Zuben'ubi	137 35.7	S15 56.8

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	1 30.1	15 09
Mars	64 31.0	10 57
Jupiter	310 33.3	18 31
Saturn	223 41.7	0 21

1977 JAN. 31, FEB. 1, 2 (MON., TUES., WED.)

	G.M.T.	SUN G.H.A.	SUN Dec.	MOON G.H.A.	MOON v	MOON Dec.	MOON d	MOON H.P.
	d h	° ′	° ′	° ′	′	° ′	′	′
	31 00	176 38.5	S17 28.2	48 21.9	11.2	N19 07.3	0.2	54.8
	01	191 38.4	27.5	62 52.1	11.3	19 07.5	0.0	54.9
	02	206 38.3	26.8	77 22.4	11.2	19 07.5	0.0	54.9
	03	221 38.2	·· 26.1	91 52.6	11.3	19 07.5	0.2	54.9
	04	236 38.1	25.4	106 22.9	11.2	19 07.3	0.2	54.9
	05	251 38.1	24.7	120 53.1	11.1	19 07.1	0.3	54.9
	06	266 38.0	S17 24.0	135 23.2	11.2	N19 06.8	0.5	55.0
	07	281 37.9	23.3	149 53.4	11.1	19 06.3	0.5	55.0
	08	296 37.8	22.6	164 23.5	11.1	19 05.8	0.6	55.0
M	09	311 37.7	·· 21.9	178 53.6	11.1	19 05.2	0.7	55.0
O	10	326 37.6	21.2	193 23.7	11.1	19 04.5	0.8	55.0
N	11	341 37.5	20.5	207 53.8	11.0	19 03.7	0.9	55.0
D	12	356 37.4	S17 19.8	222 23.8	11.0	N19 02.8	1.0	55.1
A	13	11 37.3	19.1	236 53.8	11.0	19 01.8	1.1	55.1
Y	14	26 37.2	18.4	251 23.8	11.0	19 00.7	1.1	55.1
	15	41 37.1	·· 17.7	265 53.8	11.0	18 59.6	1.3	55.1
	16	56 37.1	17.0	280 23.8	10.9	18 58.3	1.4	55.1
	17	71 37.0	16.3	294 53.7	11.0	18 56.9	1.4	55.2
	18	86 36.9	S17 15.6	309 23.7	10.9	N18 55.5	1.6	55.2
	19	101 36.8	14.9	323 53.6	10.9	18 53.9	1.7	55.2
	20	116 36.7	14.2	338 23.5	10.8	18 52.2	1.7	55.2
	21	131 36.6	·· 13.5	352 53.3	10.9	18 50.5	1.9	55.3
	22	146 36.5	12.8	7 23.2	10.8	18 48.6	1.9	55.3
	23	161 36.4	12.1	21 53.0	10.9	18 46.7	2.0	55.3
	1 00	176 36.4	S17 11.4	36 22.9	10.8	N18 44.7	2.2	55.3
	01	191 36.3	10.7	50 52.7	10.8	18 42.5	2.2	55.3
	02	206 36.2	10.0	65 22.5	10.8	18 40.3	2.3	55.4
	03	221 36.1	·· 09.3	79 52.3	10.7	18 38.0	2.4	55.4
	04	236 36.0	08.5	94 22.0	10.8	18 35.6	2.6	55.4
	05	251 35.9	07.8	108 51.8	10.7	18 33.0	2.6	55.4
	06	266 35.9	S17 07.1	123 21.5	10.8	N18 30.4	2.7	55.5
	07	281 35.8	06.4	137 51.3	10.7	18 27.7	2.8	55.5
T	08	296 35.7	05.7	152 21.0	10.7	18 24.9	2.9	55.5
U	09	311 35.6	·· 05.0	166 50.7	10.7	18 22.0	3.0	55.5
E	10	326 35.5	04.3	181 20.4	10.7	18 19.0	3.1	55.5
S	11	341 35.4	03.6	195 50.1	10.7	18 15.9	3.2	55.6
D	12	356 35.4	S17 02.9	210 19.8	10.6	N18 12.7	3.2	55.6
A	13	11 35.3	02.1	224 49.4	10.7	18 09.5	3.4	55.6
Y	14	26 35.2	01.4	239 19.1	10.7	18 06.1	3.5	55.6
	15	41 35.1	·· 00.7	253 48.8	10.6	18 02.6	3.6	55.7
	16	56 35.0	17 00.0	268 18.4	10.6	17 59.0	3.6	55.7
	17	71 35.0	16 59.3	282 48.0	10.7	17 55.4	3.8	55.7
	18	86 34.9	S16 58.6	297 17.7	10.6	N17 51.6	3.8	55.7
	19	101 34.8	57.8	311 47.3	10.6	17 47.8	4.0	55.8
	20	116 34.7	57.1	326 16.9	10.6	17 43.8	4.0	55.8
	21	131 34.6	·· 56.4	340 46.5	10.6	17 39.8	4.2	55.8
	22	146 34.6	55.7	355 16.1	10.6	17 35.6	4.2	55.8
	23	161 34.5	55.0	9 45.7	10.6	17 31.4	4.3	55.9
	2 00	176 34.4	S16 54.3	24 15.3	10.6	N17 27.1	4.4	55.9
	01	191 34.3	53.5	38 44.9	10.5	17 22.7	4.5	55.9
	02	206 34.3	52.8	53 14.4	10.6	17 18.2	4.6	55.9
	03	221 34.2	·· 52.1	67 44.0	10.6	17 13.6	4.7	55.9
	04	236 34.1	51.4	82 13.6	10.6	17 08.9	4.8	56.0
	05	251 34.0	50.7	96 43.2	10.5	17 04.1	4.9	56.0
	06	266 33.9	S16 49.9	111 12.7	10.6	N16 59.2	5.0	56.0
W	07	281 33.9	49.2	125 42.3	10.6	16 54.2	5.1	56.0
E	08	296 33.8	48.5	140 11.9	10.5	16 49.1	5.1	56.1
D	09	311 33.7	·· 47.8	154 41.4	10.6	16 44.0	5.3	56.1
N	10	326 33.7	47.0	169 11.0	10.5	16 38.7	5.3	56.1
E	11	341 33.6	46.3	183 40.5	10.6	16 33.4	5.4	56.1
S	12	356 33.5	S16 45.6	198 10.1	10.6	N16 28.0	5.6	56.2
D	13	11 33.4	44.9	212 39.7	10.5	16 22.4	5.6	56.2
A	14	26 33.4	44.1	227 09.2	10.6	16 16.8	5.7	56.2
Y	15	41 33.3	·· 43.4	241 38.8	10.5	16 11.1	5.8	56.2
	16	56 33.2	42.7	256 08.3	10.6	16 05.3	5.8	56.3
	17	71 33.1	41.9	270 37.9	10.6	15 59.5	6.0	56.3
	18	86 33.1	S16 41.2	285 07.5	10.5	N15 53.5	6.1	56.3
	19	101 33.0	40.5	299 37.0	10.6	15 47.4	6.1	56.3
	20	116 32.9	39.8	314 06.6	10.6	15 41.3	6.2	56.4
	21	131 32.9	·· 39.0	328 36.2	10.5	15 35.1	6.4	56.4
	22	146 32.8	38.3	343 05.7	10.6	15 28.7	6.4	56.4
	23	161 32.7	37.6	357 35.3	10.6	15 22.3	6.4	56.4
		S.D. 16.3	d 0.7	S.D. 15.0		15.1		15.3

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 31	Moonrise 1	Moonrise 2	Moonrise 3
°	h m	h m	h m	h m	h m	h m	h m
N 72	07 10	08 39	10 28	▭	▭	12 32	14 32
N 70	07 02	08 20	09 46	10 24	11 42	13 18	14 59
68	06 55	08 06	09 18	11 16	12 24	13 47	15 19
66	06 50	07 53	08 57	11 48	12 52	14 09	15 35
64	06 45	07 43	08 40	12 12	13 14	14 27	15 48
62	06 40	07 34	08 26	12 31	13 31	14 41	15 59
60	06 36	07 27	08 14	12 46	13 45	14 53	16 09
N 58	06 32	07 20	08 04	12 59	13 57	15 04	16 17
56	06 29	07 14	07 55	13 11	14 08	15 13	16 24
54	06 26	07 09	07 47	13 21	14 17	15 21	16 30
52	06 23	07 04	07 40	13 29	14 26	15 28	16 36
50	06 20	06 59	07 34	13 37	14 33	15 35	16 41
45	06 14	06 49	07 20	13 54	14 49	15 49	16 52
N 40	06 08	06 40	07 09	14 08	15 02	16 00	17 01
35	06 02	06 32	06 59	14 20	15 13	16 10	17 09
30	05 57	06 25	06 50	14 30	15 23	16 18	17 16
20	05 46	06 13	06 36	14 48	15 39	16 33	17 28
N 10	05 35	06 01	06 23	15 03	15 54	16 46	17 38
0	05 23	05 48	06 10	15 17	16 07	16 58	17 48
S 10	05 10	05 36	05 58	15 32	16 21	17 10	17 58
20	04 53	05 21	05 44	15 47	16 36	17 23	18 08
30	04 32	05 03	05 29	16 05	16 52	17 37	18 20
35	04 18	04 52	05 19	16 15	17 02	17 46	18 27
40	04 02	04 39	05 09	16 27	17 13	17 55	18 35
45	03 41	04 23	04 57	16 41	17 26	18 07	18 44
S 50	03 14	04 03	04 42	16 58	17 41	18 20	18 54
52	03 00	03 54	04 34	17 06	17 49	18 26	18 59
54	02 43	03 43	04 27	17 14	17 57	18 33	19 05
56	02 22	03 30	04 18	17 24	18 06	18 41	19 11
58	01 54	03 16	04 08	17 36	18 16	18 50	19 18
S 60	01 09	02 58	03 56	17 49	18 28	19 00	19 26

Lat.	Sunset	Twilight Civil	Twilight Naut.	Moonset 31	Moonset 1	Moonset 2	Moonset 3
°	h m	h m	h m	h m	h m	h m	h m
N 72	14 01	15 50	17 19	▭	▭	09 08	08 53
N 70	14 43	16 08	17 27	07 46	08 12	08 21	08 24
68	15 11	16 23	17 33	06 54	07 30	07 51	08 03
66	15 32	16 35	17 39	06 22	07 01	07 28	07 47
64	15 48	16 45	17 44	05 58	06 39	07 10	07 33
62	16 02	16 54	17 48	05 39	06 22	06 55	07 21
60	16 14	17 01	17 52	05 24	06 07	06 43	07 11
N 58	16 24	17 08	17 56	05 11	05 55	06 32	07 02
56	16 33	17 14	17 59	04 59	05 44	06 22	06 55
54	16 41	17 19	18 02	04 49	05 35	06 14	06 48
52	16 48	17 24	18 05	04 40	05 26	06 07	06 42
50	16 54	17 29	18 08	04 32	05 19	06 00	06 36
45	17 08	17 39	18 14	04 15	05 02	05 45	06 24
N 40	17 19	17 48	18 20	04 02	04 49	05 33	06 14
35	17 29	17 55	18 26	03 50	04 38	05 23	06 05
30	17 37	18 02	18 31	03 39	04 28	05 14	05 58
20	17 52	18 15	18 41	03 22	04 11	04 58	05 45
N 10	18 05	18 27	18 52	03 06	03 56	04 45	05 33
0	18 17	18 39	19 04	02 52	03 41	04 32	05 22
S 10	18 30	18 52	19 17	02 37	03 27	04 19	05 11
20	18 43	19 06	19 34	02 22	03 12	04 05	04 59
30	18 58	19 24	19 55	02 04	02 55	03 49	04 46
35	19 07	19 35	20 08	01 54	02 45	03 40	04 38
40	19 18	19 48	20 24	01 42	02 33	03 29	04 29
45	19 30	20 03	20 45	01 28	02 20	03 17	04 18
S 50	19 45	20 23	21 12	01 11	02 03	03 02	04 06
52	19 52	20 32	21 26	01 02	01 55	02 54	04 00
54	19 59	20 43	21 42	00 53	01 46	02 47	03 53
56	20 08	20 55	22 02	00 43	01 36	02 38	03 46
58	20 18	21 09	22 29	00 32	01 25	02 28	03 37
S 60	20 29	21 27	23 10	00 18	01 12	02 16	03 28

Day	SUN Eqn. of Time 00ʰ	SUN Eqn. of Time 12ʰ	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
	m s	m s	h m	h m	h m	d	
31	13 26	13 30	12 14	21 29	09 05	12	○
1	13 34	13 38	12 14	22 20	09 54	13	
2	13 42	13 46	12 14	23 10	10 45	14	

1977 FEBRUARY 3, 4, 5 (THURS., FRI., SAT.)

	G.M.T.	ARIES	VENUS −4.2		MARS +1.5		JUPITER −2.0		SATURN +0.1	
		G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
	d h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
	3 00	133 03.5	132 55.0	N 1 27.3	195 56.4	S22 01.3	83 29.7	N17 24.3	356 55.0	N17 42.9
	01	148 06.0	147 55.4	28.5	210 56.8	01.0	98 32.1	24.4	11 57.7	43.0
	02	163 08.4	162 55.8	29.7	225 57.3	00.6	113 34.4	24.4	27 00.3	43.0
	03	178 10.9	177 56.3	·· 30.9	240 57.7	·· 00.3	128 36.7	·· 24.5	42 03.0	·· 43.1
	04	193 13.4	192 56.7	32.1	255 58.1	22 00.0	143 39.0	24.5	57 05.7	43.2
	05	208 15.8	207 57.1	33.3	270 58.5	21 59.6	158 41.3	24.6	72 08.4	43.2
	06	223 18.3	222 57.6	N 1 34.5	285 59.0	S21 59.3	173 43.6	N17 24.6	87 11.0	N17 43.3
	07	238 20.7	237 58.0	35.7	300 59.4	59.0	188 45.9	24.7	102 13.7	43.3
T	08	253 23.2	252 58.5	37.0	315 59.8	58.6	203 48.2	24.7	117 16.4	43.4
H	09	268 25.7	267 58.9	·· 38.2	331 00.2	·· 58.3	218 50.5	·· 24.8	132 19.0	·· 43.5
U	10	283 28.1	282 59.3	39.4	346 00.7	58.0	233 52.8	24.8	147 21.7	43.5
R	11	298 30.6	297 59.8	40.6	1 01.1	57.7	248 55.1	24.9	162 24.4	43.6
S	12	313 33.1	313 00.2	N 1 41.8	16 01.5	S21 57.3	263 57.4	N17 24.9	177 27.0	N17 43.7
D	13	328 35.5	328 00.7	43.0	31 01.9	57.0	278 59.7	25.0	192 29.7	43.7
A	14	343 38.0	343 01.1	44.2	46 02.4	56.6	294 02.0	25.0	207 32.4	43.8
Y	15	358 40.5	358 01.6	·· 45.4	61 02.8	·· 56.3	309 04.4	·· 25.1	222 35.0	·· 43.8
	16	13 42.9	13 02.0	46.6	76 03.2	56.0	324 06.7	25.1	237 37.7	43.9
	17	28 45.4	28 02.5	47.8	91 03.6	55.6	339 09.0	25.2	252 40.4	44.0
	18	43 47.9	43 02.9	N 1 49.0	106 04.1	S21 55.3	354 11.3	N17 25.3	267 43.0	N17 44.0
	19	58 50.3	58 03.4	50.2	121 04.5	55.0	9 13.6	25.3	282 45.7	44.1
	20	73 52.8	73 03.8	51.4	136 04.9	54.6	24 15.9	25.4	297 48.4	44.2
	21	88 55.2	88 04.3	·· 52.6	151 05.3	·· 54.3	39 18.2	·· 25.4	312 51.0	·· 44.2
	22	103 57.7	103 04.7	53.8	166 05.8	54.0	54 20.5	25.5	327 53.7	44.3
	23	119 00.2	118 05.2	55.0	181 06.2	53.6	69 22.8	25.5	342 56.4	44.3
	4 00	134 02.6	133 05.6	N 1 56.2	196 06.6	S21 53.3	84 25.1	N17 25.6	357 59.1	N17 44.4
	01	149 05.1	148 06.1	57.5	211 07.0	52.9	99 27.4	25.6	13 01.7	44.5
	02	164 07.6	163 06.6	58.7	226 07.5	52.6	114 29.7	25.7	28 04.4	44.5
	03	179 10.0	178 07.0	1 59.9	241 07.9	·· 52.3	129 32.0	·· 25.7	43 07.1	·· 44.6
	04	194 12.5	193 07.5	2 01.1	256 08.3	51.9	144 34.3	25.8	58 09.7	44.7
	05	209 15.0	208 07.9	02.3	271 08.8	51.6	159 36.6	25.8	73 12.4	44.7
	06	224 17.4	223 08.4	N 2 03.5	286 09.2	S21 51.2	174 38.9	N17 25.9	88 15.1	N17 44.8
	07	239 19.9	238 08.9	04.7	301 09.6	50.9	189 41.2	25.9	103 17.7	44.8
	08	254 22.3	253 09.3	05.9	316 10.0	50.6	204 43.5	26.0	118 20.4	44.9
F	09	269 24.8	268 09.8	·· 07.1	331 10.5	·· 50.2	219 45.8	·· 26.0	133 23.1	·· 45.0
R	10	284 27.3	283 10.3	08.3	346 10.9	49.9	234 48.1	26.1	148 25.7	45.0
I	11	299 29.7	298 10.7	09.5	1 11.3	49.5	249 50.4	26.2	163 28.4	45.1
D	12	314 32.2	313 11.2	N 2 10.7	16 11.7	S21 49.2	264 52.7	N17 26.2	178 31.1	N17 45.2
A	13	329 34.7	328 11.7	11.9	31 12.2	48.8	279 55.0	26.3	193 33.7	45.2
Y	14	344 37.1	343 12.2	13.1	46 12.6	48.5	294 57.3	26.3	208 36.4	45.3
	15	359 39.6	358 12.6	·· 14.3	61 13.0	·· 48.1	309 59.6	·· 26.4	223 39.1	·· 45.3
	16	14 42.1	13 13.1	15.5	76 13.5	47.8	325 01.9	26.4	238 41.7	45.4
	17	29 44.5	28 13.6	16.7	91 13.9	47.5	340 04.2	26.5	253 44.4	45.5
	18	44 47.0	43 14.1	N 2 17.9	106 14.3	S21 47.1	355 06.5	N17 26.5	268 47.1	N17 45.5
	19	59 49.5	58 14.5	19.1	121 14.7	46.8	10 08.8	26.6	283 49.8	45.6
	20	74 51.9	73 15.0	20.3	136 15.2	46.4	25 11.1	26.6	298 52.4	45.7
	21	89 54.4	88 15.5	·· 21.5	151 15.6	·· 46.1	40 13.4	·· 26.7	313 55.1	·· 45.7
	22	104 56.8	103 16.0	22.7	166 16.0	45.7	55 15.7	26.7	328 57.8	45.8
	23	119 59.3	118 16.4	23.9	181 16.5	45.4	70 17.9	26.8	344 00.4	45.8
	5 00	135 01.8	133 16.9	N 2 25.1	196 16.9	S21 45.0	85 20.2	N17 26.9	359 03.1	N17 45.9
	01	150 04.2	148 17.4	26.3	211 17.3	44.7	100 22.5	26.9	14 05.8	46.0
	02	165 06.7	163 17.9	27.5	226 17.7	44.3	115 24.8	27.0	29 08.4	46.0
	03	180 09.2	178 18.4	·· 28.7	241 18.2	·· 44.0	130 27.1	·· 27.0	44 11.1	·· 46.1
	04	195 11.6	193 18.9	29.9	256 18.6	43.6	145 29.4	27.1	59 13.8	46.2
	05	210 14.1	208 19.4	31.0	271 19.0	43.3	160 31.7	27.1	74 16.4	46.2
	06	225 16.6	223 19.8	N 2 32.2	286 19.5	S21 42.9	175 34.0	N17 27.2	89 19.1	N17 46.3
	07	240 19.0	238 20.3	33.4	301 19.9	42.6	190 36.3	27.2	104 21.8	46.3
S	08	255 21.5	253 20.8	34.6	316 20.3	42.2	205 38.6	27.3	119 24.4	46.4
A	09	270 24.0	268 21.3	·· 35.8	331 20.8	·· 41.9	220 40.9	·· 27.3	134 27.1	·· 46.5
T	10	285 26.4	283 21.8	37.0	346 21.2	41.5	235 43.2	27.4	149 29.8	46.5
U	11	300 28.9	298 22.3	38.2	1 21.6	41.2	250 45.5	27.5	164 32.4	46.6
R	12	315 31.3	313 22.8	N 2 39.4	16 22.0	S21 40.8	265 47.7	N17 27.5	179 35.1	N17 46.7
D	13	330 33.8	328 23.3	40.6	31 22.5	40.4	280 50.0	27.6	194 37.8	46.7
A	14	345 36.3	343 23.8	41.8	46 22.9	40.1	295 52.3	27.6	209 40.4	46.8
Y	15	0 38.7	358 24.3	·· 43.0	61 23.3	·· 39.7	310 54.6	·· 27.7	224 43.1	·· 46.8
	16	15 41.2	13 24.8	44.2	76 23.8	39.4	325 56.9	27.7	239 45.8	46.9
	17	30 43.7	28 25.3	45.4	91 24.2	39.0	340 59.2	27.8	254 48.4	47.0
	18	45 46.1	43 25.8	N 2 46.6	106 24.6	S21 38.7	356 01.5	N17 27.8	269 51.1	N17 47.0
	19	60 48.6	58 26.3	47.8	121 25.1	38.3	11 03.8	27.9	284 53.8	47.1
	20	75 51.1	73 26.8	49.0	136 25.5	38.0	26 06.1	28.0	299 56.5	47.1
	21	90 53.5	88 27.3	·· 50.2	151 25.9	·· 37.6	41 08.3	·· 28.0	314 59.1	·· 47.2
	22	105 56.0	103 27.8	51.3	166 26.4	37.2	56 10.6	28.1	330 01.8	47.3
	23	120 58.5	118 28.3	52.5	181 26.8	36.9	71 12.9	28.1	345 04.5	47.3
	Mer. Pass.	h m 15 01.4	v 0.5	d 1.2	v 0.4	d 0.3	v 2.3	d 0.1	v 2.7	d 0.1

STARS

Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 39.1	S40 24.1
Achernar	335 47.3	S57 21.5
Acrux	173 39.4	S62 58.2
Adhara	255 33.7	S28 56.7
Aldebaran	291 20.6	N16 27.8
Alioth	166 44.4	N56 04.7
Alkaid	153 20.3	N49 25.3
Al Na'ir	28 18.5	S47 04.4
Alnilam	276 13.9	S 1 13.2
Alphard	218 22.6	S 8 33.7
Alphecca	126 34.2	N26 47.3
Alpheratz	358 12.0	N28 57.9
Altair	62 35.2	N 8 48.5
Ankaa	353 42.9	S42 26.0
Antares	113 00.0	S26 22.8
Arcturus	146 20.6	N19 17.9
Atria	108 26.6	S68 58.9
Avior	234 28.5	S59 26.4
Bellatrix	279 01.1	N 6 19.6
Betelgeuse	271 30.6	N 7 24.0
Canopus	264 07.8	S52 41.3
Capella	281 14.6	N45 58.6
Deneb	49 50.5	N45 11.9
Denebola	183 01.3	N14 41.8
Diphda	349 23.5	S18 06.9
Dubhe	194 24.6	N61 52.2
Elnath	278 46.9	N28 35.3
Eltanin	90 59.2	N51 29.4
Enif	34 14.3	N 9 46.2
Fomalhaut	15 54.4	S29 44.7
Gacrux	172 31.0	S56 59.0
Gienah	176 20.2	S17 25.0
Hadar	149 26.5	S60 15.6
Hamal	328 31.7	N23 21.3
Kaus Aust.	84 20.4	S34 23.6
Kochab	137 19.0	N74 14.6
Markab	14 05.8	N15 05.0
Menkar	314 43.6	N 3 59.9
Menkent	148 39.7	S36 15.4
Miaplacidus	221 44.4	S69 37.5
Mirfak	309 19.4	N49 47.0
Nunki	76 32.5	S26 19.5
Peacock	54 02.8	S56 48.5
Pollux	244 00.8	N28 04.8
Procyon	245 28.0	N 5 16.8
Rasalhague	96 32.0	N12 34.5
Regulus	208 12.3	N12 04.5
Rigel	281 38.1	S 8 13.9
Rigil Kent.	140 29.0	S60 44.2
Sabik	102 44.1	S15 41.8
Schedar	350 12.0	N56 24.9
Shaula	96 59.3	S37 05.1
Sirius	258 57.5	S16 41.3
Spica	158 59.9	S11 02.6
Suhail	223 12.1	S43 20.6
Vega	80 57.8	N38 45.6
Zuben'ubi	137 35.7	S15 56.8

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	359 03.0	15 07
Mars	62 04.0	10 55
Jupiter	310 22.4	18 20
Saturn	223 56.4	0 08

	G.M.T.	SUN G.H.A.	SUN Dec.	MOON G.H.A.	MOON v	MOON Dec.	MOON d	MOON H.P.
	d h	° ′	° ′	° ′	′	° ′	′	′
	3 00	176 32.7	S16 36.8	12 04.9	10.6	N15 15.9	6.6	56.5
	01	191 32.6	36.1	26 34.5	10.5	15 09.3	6.7	56.5
	02	206 32.5	35.4	41 04.0	10.6	15 02.6	6.7	56.5
	03	221 32.5	· · 34.6	55 33.6	10.6	14 55.9	6.9	56.5
	04	236 32.4	33.9	70 03.2	10.6	14 49.0	6.9	56.6
	05	251 32.3	33.2	84 32.8	10.6	14 42.1	7.0	56.6
	06	266 32.3	S16 32.4	99 02.4	10.6	N14 35.1	7.0	56.6
	07	281 32.2	31.7	113 32.0	10.6	14 28.1	7.2	56.6
T	08	296 32.1	31.0	128 01.6	10.6	14 20.9	7.2	56.7
H	09	311 32.1	· · 30.2	142 31.2	10.7	14 13.7	7.4	56.7
U	10	326 32.0	29.5	157 00.9	10.6	14 06.3	7.4	56.7
R	11	341 31.9	28.8	171 30.5	10.6	13 58.9	7.5	56.7
S	12	356 31.9	S16 28.0	186 00.1	10.7	N13 51.4	7.5	56.8
D	13	11 31.8	27.3	200 29.8	10.6	13 43.9	7.7	56.8
A	14	26 31.7	26.5	214 59.4	10.7	13 36.2	7.7	56.8
Y	15	41 31.7	· · 25.8	229 29.1	10.6	13 28.5	7.8	56.8
	16	56 31.6	25.1	243 58.7	10.7	13 20.7	7.9	56.9
	17	71 31.5	24.3	258 28.4	10.6	13 12.8	7.9	56.9
	18	86 31.5	S16 23.6	272 58.0	10.7	N13 04.9	8.0	56.9
	19	101 31.4	22.8	287 27.7	10.7	12 56.9	8.1	56.9
	20	116 31.4	22.1	301 57.4	10.7	12 48.8	8.2	57.0
	21	131 31.3	· · 21.4	316 27.1	10.7	12 40.6	8.3	57.0
	22	146 31.2	20.6	330 56.8	10.7	12 32.3	8.3	57.0
	23	161 31.2	19.9	345 26.5	10.7	12 24.0	8.4	57.0
	4 00	176 31.1	S16 19.1	359 56.2	10.7	N12 15.6	8.4	57.1
	01	191 31.1	18.4	14 25.9	10.7	12 07.2	8.6	57.1
	02	206 31.0	17.6	28 55.6	10.7	11 58.6	8.6	57.1
	03	221 30.9	· · 16.9	43 25.3	10.8	11 50.0	8.7	57.1
	04	236 30.9	16.2	57 55.1	10.7	11 41.3	8.7	57.2
	05	251 30.8	15.4	72 24.8	10.7	11 32.6	8.8	57.2
	06	266 30.8	S16 14.7	86 54.5	10.8	N11 23.8	8.9	57.2
	07	281 30.7	13.9	101 24.3	10.8	11 14.9	8.9	57.2
	08	296 30.6	13.2	115 54.1	10.7	11 06.0	9.1	57.3
F	09	311 30.6	· · 12.4	130 23.8	10.8	10 56.9	9.0	57.3
R	10	326 30.5	11.7	144 53.6	10.8	10 47.9	9.2	57.3
I	11	341 30.5	10.9	159 23.4	10.8	10 38.7	9.2	57.3
D	12	356 30.4	S16 10.2	173 53.2	10.7	N10 29.5	9.2	57.4
A	13	11 30.4	09.4	188 22.9	10.8	10 20.3	9.4	57.4
Y	14	26 30.3	08.7	202 52.7	10.8	10 10.9	9.4	57.4
	15	41 30.3	· · 07.9	217 22.5	10.9	10 01.5	9.4	57.4
	16	56 30.2	07.2	231 52.4	10.8	9 52.1	9.5	57.5
	17	71 30.1	06.4	246 22.2	10.8	9 42.6	9.6	57.5
	18	86 30.1	S16 05.7	260 52.0	10.8	N 9 33.0	9.6	57.5
	19	101 30.0	04.9	275 21.8	10.8	9 23.4	9.7	57.5
	20	116 30.0	04.2	289 51.6	10.9	9 13.7	9.7	57.5
	21	131 29.9	· · 03.4	304 21.5	10.8	9 04.0	9.8	57.6
	22	146 29.9	02.7	318 51.3	10.9	8 54.2	9.9	57.6
	23	161 29.8	01.9	333 21.2	10.8	8 44.3	9.9	57.6
	5 00	176 29.8	S16 01.1	347 51.0	10.9	N 8 34.4	9.9	57.6
	01	191 29.7	16 00.4	2 20.9	10.8	8 24.5	10.0	57.7
	02	206 29.7	15 59.6	16 50.7	10.9	8 14.5	10.1	57.7
	03	221 29.6	· · 58.9	31 20.6	10.8	8 04.4	10.1	57.7
	04	236 29.6	58.1	45 50.4	10.9	7 54.3	10.2	57.7
	05	251 29.5	57.4	60 20.3	10.9	7 44.1	10.2	57.7
	06	266 29.5	S15 56.6	74 50.2	10.9	N 7 33.9	10.2	57.8
	07	281 29.4	55.8	89 20.1	10.8	7 23.7	10.3	57.8
S	08	296 29.4	55.1	103 49.9	10.9	7 13.4	10.3	57.8
A	09	311 29.3	· · 54.3	118 19.8	10.9	7 03.1	10.4	57.8
T	10	326 29.3	53.6	132 49.7	10.9	6 52.7	10.5	57.8
U	11	341 29.2	52.8	147 19.6	10.8	6 42.2	10.4	57.9
R	12	356 29.2	S15 52.1	161 49.4	10.9	N 6 31.8	10.5	57.9
D	13	11 29.1	51.3	176 19.3	10.9	6 21.3	10.6	57.9
A	14	26 29.1	50.5	190 49.2	10.9	6 10.7	10.6	57.9
Y	15	41 29.0	· · 49.8	205 19.1	10.9	6 00.1	10.6	57.9
	16	56 29.0	49.0	219 49.0	10.9	5 49.5	10.7	58.0
	17	71 28.9	48.2	234 18.9	10.9	5 38.8	10.7	58.0
	18	86 28.9	S15 47.5	248 48.8	10.8	N 5 28.1	10.7	58.0
	19	101 28.9	46.7	263 18.6	10.9	5 17.4	10.8	58.0
	20	116 28.8	45.9	277 48.5	10.9	5 06.6	10.8	58.0
	21	131 28.8	· · 45.2	292 18.4	10.9	4 55.8	10.9	58.1
	22	146 28.7	44.4	306 48.3	10.8	4 44.9	10.8	58.1
	23	161 28.7	43.7	321 18.1	10.9	4 34.1	10.9	58.1
		S.D. 16.2	d 0.7	S.D. 15.5		15.6		15.8

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 3	Moonrise 4	Moonrise 5	Moonrise 6
°	h m	h m	h m	h m	h m	h m	h m
N 72	06 59	08 25	10 05	14 32	16 27	18 19	20 11
N 70	06 52	08 09	09 30	14 59	16 43	18 27	20 12
68	06 47	07 56	09 05	15 19	16 56	18 34	20 13
66	06 42	07 45	08 46	15 35	17 06	18 39	20 13
64	06 38	07 35	08 31	15 48	17 14	18 43	20 14
62	06 34	07 28	08 18	15 59	17 22	18 47	20 14
60	06 30	07 21	08 07	16 09	17 28	18 50	20 14
N 58	06 27	07 14	07 58	16 17	17 34	18 53	20 15
56	06 24	07 09	07 49	16 24	17 39	18 56	20 15
54	06 21	07 04	07 42	16 30	17 43	18 58	20 15
52	06 19	06 59	07 35	16 36	17 47	19 00	20 15
50	06 16	06 55	07 29	16 41	17 51	19 02	20 15
45	06 11	06 45	07 17	16 52	17 58	19 07	20 16
N 40	06 05	06 37	07 06	17 01	18 05	19 10	20 16
35	06 00	06 30	06 57	17 09	18 11	19 13	20 17
30	05 55	06 24	06 49	17 16	18 15	19 16	20 17
20	05 45	06 12	06 35	17 28	18 24	19 20	20 17
N 10	05 35	06 00	06 22	17 38	18 31	19 24	20 18
0	05 24	05 49	06 10	17 48	18 38	19 28	20 18
S 10	05 11	05 37	05 59	17 58	18 45	19 32	20 19
20	04 55	05 23	05 46	18 08	18 53	19 36	20 19
30	04 35	05 06	05 31	18 20	19 01	19 41	20 20
35	04 22	04 55	05 22	18 27	19 06	19 43	20 20
40	04 07	04 43	05 13	18 35	19 11	19 46	20 21
45	03 47	04 28	05 01	18 44	19 18	19 50	20 21
S 50	03 21	04 09	04 47	18 54	19 25	19 54	20 22
52	03 08	04 00	04 40	18 59	19 29	19 56	20 22
54	02 52	03 50	04 33	19 05	19 33	19 58	20 22
56	02 33	03 38	04 24	19 11	19 37	20 00	20 22
58	02 09	03 25	04 15	19 18	19 42	20 03	20 23
S 60	01 34	03 09	04 04	19 26	19 47	20 06	20 23

Lat.	Sunset	Twilight Civil	Twilight Naut.	Moonset 3	Moonset 4	Moonset 5	Moonset 6
°	h m	h m	h m	h m	h m	h m	h m
N 72	14 25	16 04	17 31	08 53	08 43	08 34	08 27
N 70	14 59	16 20	17 37	08 24	08 25	08 24	08 23
68	15 24	16 34	17 43	08 03	08 11	08 16	08 20
66	15 43	16 44	17 47	07 47	08 00	08 09	08 18
64	15 58	16 54	17 51	07 33	07 50	08 04	08 16
62	16 11	17 01	17 55	07 21	07 42	07 59	08 14
60	16 22	17 08	17 59	07 11	07 34	07 54	08 12
N 58	16 31	17 14	18 02	07 02	07 28	07 50	08 11
56	16 39	17 20	18 05	06 55	07 22	07 47	08 09
54	16 47	17 25	18 07	06 48	07 17	07 44	08 08
52	16 53	17 30	18 10	06 42	07 13	07 41	08 07
50	16 59	17 34	18 12	06 36	07 09	07 38	08 06
45	17 12	17 43	18 18	06 24	07 00	07 32	08 04
N 40	17 23	17 51	18 23	06 14	06 52	07 28	08 02
35	17 32	17 58	18 28	06 05	06 45	07 23	08 00
30	17 40	18 05	18 33	05 58	06 40	07 20	07 59
20	17 54	18 16	18 43	05 45	06 30	07 13	07 56
N 10	18 06	18 28	18 53	05 33	06 21	07 08	07 54
0	18 17	18 39	19 04	05 22	06 12	07 02	07 52
S 10	18 29	18 51	19 17	05 11	06 04	06 57	07 50
20	18 42	19 05	19 32	04 59	05 55	06 51	07 48
30	18 56	19 22	19 52	04 46	05 44	06 44	07 45
35	19 05	19 32	20 05	04 38	05 38	06 40	07 43
40	19 15	19 44	20 20	04 29	05 32	06 36	07 42
45	19 26	19 59	20 40	04 18	05 23	06 31	07 39
S 50	19 40	20 17	21 05	04 06	05 14	06 25	07 37
52	19 47	20 26	21 18	04 00	05 09	06 22	07 36
54	19 54	20 36	21 33	03 53	05 04	06 19	07 35
56	20 02	20 48	21 52	03 46	04 59	06 15	07 33
58	20 11	21 01	22 15	03 37	04 53	06 11	07 32
S 60	20 22	21 17	22 48	03 28	04 46	06 07	07 30

Day	SUN Eqn. of Time 00ʰ	SUN Eqn. of Time 12ʰ	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
	m s	m s	h m	h m	h m	d	
3	13 49	13 52	12 14	24 00	11 35	15	○
4	13 55	13 58	12 14	00 00	12 25	16	
5	14 01	14 03	12 14	00 50	13 15	17	

1977 FEBRUARY 6, 7, 8 (SUN., MON., TUES.)

G.M.T.	ARIES	VENUS −4.2		MARS +1.5		JUPITER −2.0		SATURN +0.1	
	G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
d h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
6 00	136 00.9	133 28.8	N 2 53.7	196 27.2	S21 36.5	86 15.2	N17 28.2	0 07.1	N17 47.4
01	151 03.4	148 29.3	54.9	211 27.7	36.2	101 17.5	28.2	15 09.8	47.5
02	166 05.8	163 29.8	56.1	226 28.1	35.8	116 19.8	28.3	30 12.5	47.5
03	181 08.3	178 30.4	·· 57.3	241 28.5	·· 35.4	131 22.1	·· 28.4	45 15.1	·· 47.6
04	196 10.8	193 30.9	58.5	256 28.9	35.1	146 24.3	28.4	60 17.8	47.6
05	211 13.2	208 31.4	2 59.7	271 29.4	34.7	161 26.6	28.5	75 20.5	47.7
06	226 15.7	223 31.9	N 3 00.9	286 29.8	S21 34.4	176 28.9	N17 28.5	90 23.1	N17 47.8
07	241 18.2	238 32.4	02.1	301 30.2	34.0	191 31.2	28.6	105 25.8	47.8
08	256 20.6	253 32.9	03.2	316 30.7	33.6	206 33.5	28.6	120 28.5	47.9
S 09	271 23.1	268 33.4	·· 04.4	331 31.1	·· 33.3	221 35.8	·· 28.7	135 31.1	·· 48.0
U 10	286 25.6	283 34.0	05.6	346 31.5	32.9	236 38.0	28.7	150 33.8	48.0
N 11	301 28.0	298 34.5	06.8	1 32.0	32.5	251 40.3	28.8	165 36.5	48.1
D 12	316 30.5	313 35.0	N 3 08.0	16 32.4	S21 32.2	266 42.6	N17 28.9	180 39.1	N17 48.1
A 13	331 32.9	328 35.5	09.2	31 32.8	31.8	281 44.9	28.9	195 41.8	48.2
Y 14	346 35.4	343 36.0	10.4	46 33.3	31.5	296 47.2	29.0	210 44.5	48.3
15	1 37.9	358 36.6	·· 11.5	61 33.7	·· 31.1	311 49.5	·· 29.0	225 47.1	·· 48.3
16	16 40.3	13 37.1	12.7	76 34.1	30.7	326 51.7	29.1	240 49.8	48.4
17	31 42.8	28 37.6	13.9	91 34.6	30.4	341 54.0	29.2	255 52.5	48.4
18	46 45.3	43 38.1	N 3 15.1	106 35.0	S21 30.0	356 56.3	N17 29.2	270 55.1	N17 48.5
19	61 47.7	58 38.7	16.3	121 35.4	29.6	11 58.6	29.3	285 57.8	48.6
20	76 50.2	73 39.2	17.5	136 35.9	29.3	27 00.9	29.3	301 00.5	48.6
21	91 52.7	88 39.7	·· 18.7	151 36.3	·· 28.9	42 03.1	·· 29.4	316 03.1	·· 48.7
22	106 55.1	103 40.3	19.8	166 36.7	28.5	57 05.4	29.4	331 05.8	48.8
23	121 57.6	118 40.8	21.0	181 37.2	28.2	72 07.7	29.5	346 08.5	48.8
7 00	137 00.1	133 41.3	N 3 22.2	196 37.6	S21 27.8	87 10.0	N17 29.6	1 11.2	N17 48.9
01	152 02.5	148 41.9	23.4	211 38.0	27.4	102 12.3	29.6	16 13.8	48.9
02	167 05.0	163 42.4	24.6	226 38.5	27.0	117 14.5	29.7	31 16.5	49.0
03	182 07.4	178 42.9	·· 25.8	241 38.9	·· 26.7	132 16.8	·· 29.7	46 19.2	·· 49.1
04	197 09.9	193 43.5	26.9	256 39.4	26.3	147 19.1	29.8	61 21.8	49.1
05	212 12.4	208 44.0	28.1	271 39.8	25.9	162 21.4	29.8	76 24.5	49.2
06	227 14.8	223 44.6	N 3 29.3	286 40.2	S21 25.6	177 23.6	N17 29.9	91 27.2	N17 49.2
07	242 17.3	238 45.1	30.5	301 40.7	25.2	192 25.9	30.0	106 29.8	49.3
08	257 19.8	253 45.6	31.7	316 41.1	24.8	207 28.2	30.0	121 32.5	49.4
M 09	272 22.2	268 46.2	·· 32.8	331 41.5	·· 24.4	222 30.5	·· 30.1	136 35.2	·· 49.4
O 10	287 24.7	283 46.7	34.0	346 42.0	24.1	237 32.7	30.1	151 37.8	49.5
N 11	302 27.2	298 47.3	35.2	1 42.4	23.7	252 35.0	30.2	166 40.5	49.6
D 12	317 29.6	313 47.8	N 3 36.4	16 42.8	S21 23.3	267 37.3	N17 30.3	181 43.2	N17 49.6
A 13	332 32.1	328 48.4	37.6	31 43.3	23.0	282 39.6	30.3	196 45.8	49.7
Y 14	347 34.6	343 48.9	38.7	46 43.7	22.6	297 41.8	30.4	211 48.5	49.7
15	2 37.0	358 49.5	·· 39.9	61 44.1	·· 22.2	312 44.1	·· 30.4	226 51.2	·· 49.8
16	17 39.5	13 50.0	41.1	76 44.6	21.8	327 46.4	30.5	241 53.8	49.9
17	32 41.9	28 50.6	42.3	91 45.0	21.5	342 48.7	30.6	256 56.5	49.9
18	47 44.4	43 51.1	N 3 43.5	106 45.5	S21 21.1	357 50.9	N17 30.6	271 59.2	N17 50.0
19	62 46.9	58 51.7	44.6	121 45.9	20.7	12 53.2	30.7	287 01.8	50.0
20	77 49.3	73 52.2	45.8	136 46.3	20.3	27 55.5	30.7	302 04.5	50.1
21	92 51.8	88 52.8	·· 47.0	151 46.8	·· 19.9	42 57.8	·· 30.8	317 07.2	·· 50.2
22	107 54.3	103 53.4	48.2	166 47.2	19.6	58 00.0	30.9	332 09.8	50.2
23	122 56.7	118 53.9	49.3	181 47.6	19.2	73 02.3	30.9	347 12.5	50.3
8 00	137 59.2	133 54.5	N 3 50.5	196 48.1	S21 18.8	88 04.6	N17 31.0	2 15.2	N17 50.4
01	153 01.7	148 55.0	51.7	211 48.5	18.4	103 06.8	31.0	17 17.8	50.4
02	168 04.1	163 55.6	52.9	226 48.9	18.1	118 09.1	31.1	32 20.5	50.5
03	183 06.6	178 56.2	·· 54.0	241 49.4	·· 17.7	133 11.4	·· 31.2	47 23.2	·· 50.5
04	198 09.0	193 56.7	55.2	256 49.8	17.3	148 13.6	31.2	62 25.8	50.6
05	213 11.5	208 57.3	56.4	271 50.3	16.9	163 15.9	31.3	77 28.5	50.7
06	228 14.0	223 57.9	N 3 57.6	286 50.7	S21 16.5	178 18.2	N17 31.3	92 31.2	N17 50.7
07	243 16.4	238 58.4	58.7	301 51.1	16.2	193 20.5	31.4	107 33.8	50.8
08	258 18.9	253 59.0	3 59.9	316 51.6	15.8	208 22.7	31.5	122 36.5	50.8
T 09	273 21.4	268 59.6	4 01.1	331 52.0	·· 15.4	223 25.0	·· 31.5	137 39.2	·· 50.9
U 10	288 23.8	284 00.1	02.2	346 52.5	15.0	238 27.3	31.6	152 41.8	51.0
E 11	303 26.3	299 00.7	03.4	1 52.9	14.6	253 29.5	31.6	167 44.5	51.0
S 12	318 28.8	314 01.3	N 4 04.6	16 53.3	S21 14.2	268 31.8	N17 31.7	182 47.2	N17 51.1
D 13	333 31.2	329 01.9	05.8	31 53.8	13.9	283 34.1	31.8	197 49.8	51.1
A 14	348 33.7	344 02.4	06.9	46 54.2	13.5	298 36.3	31.8	212 52.5	51.2
Y 15	3 36.2	359 03.0	·· 08.1	61 54.6	·· 13.1	313 38.6	·· 31.9	227 55.2	·· 51.3
16	18 38.6	14 03.6	09.3	76 55.1	12.7	328 40.9	31.9	242 57.8	51.3
17	33 41.1	29 04.2	10.4	91 55.5	12.3	343 43.1	32.0	258 00.5	51.4
18	48 43.5	44 04.8	N 4 11.6	106 56.0	S21 11.9	358 45.4	N17 32.1	273 03.2	N17 51.5
19	63 46.0	59 05.3	12.8	121 56.4	11.5	13 47.6	32.1	288 05.8	51.5
20	78 48.5	74 05.9	13.9	136 56.8	11.2	28 49.9	32.2	303 08.5	51.6
21	93 50.9	89 06.5	·· 15.1	151 57.3	·· 10.8	43 52.2	·· 32.3	318 11.2	·· 51.6
22	108 53.4	104 07.1	16.3	166 57.7	10.4	58 54.4	32.3	333 13.8	51.7
23	123 55.9	119 07.7	17.4	181 58.2	10.0	73 56.7	32.4	348 16.5	51.8
Mer. Pass.	h m 14 49.6	v 0.5	d 1.2	v 0.4	d 0.4	v 2.3	d 0.1	v 2.7	d 0.1

STARS

Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 39.1	S40 24.1
Achernar	335 47.4	S57 21.5
Acrux	173 39.4	S62 58.2
Adhara	255 33.7	S28 56.7
Aldebaran	291 20.6	N16 27.8
Alioth	166 44.4	N56 04.7
Alkaid	153 20.3	N49 25.3
Al Na'ir	28 18.5	S47 04.4
Alnilam	276 13.9	S 1 13.2
Alphard	218 22.6	S 8 33.8
Alphecca	126 34.2	N26 47.3
Alpheratz	358 12.0	N28 57.9
Altair	62 35.2	N 8 48.4
Ankaa	353 42.9	S42 26.0
Antares	112 59.9	S26 22.8
Arcturus	146 20.6	N19 17.9
Atria	108 26.6	S68 58.9
Avior	234 28.5	S59 26.4
Bellatrix	279 01.1	N 6 19.6
Betelgeuse	271 30.7	N 7 24.0
Canopus	264 07.9	S52 41.3
Capella	281 14.6	N45 58.6
Deneb	49 50.5	N45 11.9
Denebola	183 01.3	N14 41.8
Diphda	349 23.5	S18 06.9
Dubhe	194 24.6	N61 52.2
Elnath	278 47.0	N28 35.3
Eltanin	90 59.2	N51 29.3
Enif	34 14.3	N 9 46.2
Fomalhaut	15 54.4	S29 44.7
Gacrux	172 31.0	S56 59.0
Gienah	176 20.2	S17 25.0
Hadar	149 26.5	S60 15.6
Hamal	328 31.7	N23 21.3
Kaus Aust.	84 20.3	S34 23.6
Kochab	137 19.0	N74 14.6
Markab	14 05.8	N15 04.9
Menkar	314 43.6	N 3 59.9
Menkent	148 39.7	S36 15.4
Miaplacidus	221 44.4	S69 37.5
Mirfak	309 19.5	N49 47.0
Nunki	76 32.5	S26 19.5
Peacock	54 02.8	S56 48.5
Pollux	244 00.8	N28 04.8
Procyon	245 28.0	N 5 16.8
Rasalhague	96 32.0	N12 34.5
Regulus	208 12.3	N12 04.5
Rigel	281 38.2	S 8 13.9
Rigil Kent.	140 28.9	S60 44.2
Sabik	102 44.1	S15 41.8
Schedar	350 12.0	N56 24.9
Shaula	96 59.3	S37 05.1
Sirius	258 57.5	S16 41.4
Spica	158 59.9	S11 02.6
Suhail	223 12.1	S43 20.6
Vega	80 57.8	N38 45.6
Zuben'ubi	137 35.7	S15 56.8

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	356 41.3	15 05
Mars	59 37.6	10 53
Jupiter	310 09.9	18 09
Saturn	224 11.1	23 51

G.M.T.		SUN		MOON				
		G.H.A.	Dec.	G.H.A.	v	Dec.	d	H.P.
d	h	° ′	° ′	° ′	′	° ′	′	′
6	00	176 28.6	S15 42.9	335 48.0	10.9	N 4 23.2	11.0	58.1
	01	191 28.6	42.1	350 17.9	10.9	4 12.2	10.9	58.1
	02	206 28.5	41.4	4 47.8	10.8	4 01.3	11.0	58.2
	03	221 28.5	·· 40.6	19 17.6	10.9	3 50.3	11.0	58.2
	04	236 28.5	39.8	33 47.5	10.8	3 39.3	11.1	58.2
	05	251 28.4	39.0	48 17.3	10.9	3 28.2	11.0	58.2
	06	266 28.4	S15 38.3	62 47.2	10.8	N 3 17.2	11.1	58.2
	07	281 28.3	37.5	77 17.0	10.8	3 06.1	11.2	58.2
	08	296 28.3	36.7	91 46.8	10.9	2 54.9	11.1	58.3
S	09	311 28.3	·· 36.0	106 16.7	10.8	2 43.8	11.1	58.3
U	10	326 28.2	35.2	120 46.5	10.8	2 32.7	11.2	58.3
N	11	341 28.2	34.4	135 16.3	10.8	2 21.5	11.2	58.3
D	12	356 28.1	S15 33.7	149 46.1	10.8	N 2 10.3	11.2	58.3
A	13	11 28.1	32.9	164 15.9	10.8	1 59.1	11.2	58.4
Y	14	26 28.1	32.1	178 45.7	10.8	1 47.9	11.3	58.4
	15	41 28.0	·· 31.3	193 15.5	10.7	1 36.6	11.2	58.4
	16	56 28.0	30.6	207 45.2	10.8	1 25.4	11.3	58.4
	17	71 27.9	29.8	222 15.0	10.7	1 14.1	11.3	58.4
	18	86 27.9	S15 29.0	236 44.7	10.8	N 1 02.8	11.3	58.4
	19	101 27.9	28.2	251 14.5	10.7	0 51.5	11.2	58.4
	20	116 27.8	27.5	265 44.2	10.7	0 40.3	11.4	58.5
	21	131 27.8	·· 26.7	280 13.9	10.7	0 28.9	11.3	58.5
	22	146 27.8	25.9	294 43.6	10.7	0 17.6	11.3	58.5
	23	161 27.7	25.1	309 13.3	10.6	N 0 06.3	11.3	58.5
7	00	176 27.7	S15 24.4	323 42.9	10.7	S 0 05.0	11.3	58.5
	01	191 27.7	23.6	338 12.6	10.6	0 16.3	11.4	58.5
	02	206 27.6	22.8	352 42.2	10.6	0 27.7	11.3	58.6
	03	221 27.6	·· 22.0	7 11.8	10.6	0 39.0	11.3	58.6
	04	236 27.6	21.2	21 41.4	10.6	0 50.3	11.4	58.6
	05	251 27.5	20.5	36 11.0	10.6	1 01.7	11.3	58.6
	06	266 27.5	S15 19.7	50 40.6	10.6	S 1 13.0	11.3	58.6
	07	281 27.5	18.9	65 10.2	10.5	1 24.3	11.4	58.6
	08	296 27.4	18.1	79 39.7	10.5	1 35.7	11.3	58.6
M	09	311 27.4	·· 17.3	94 09.2	10.5	1 47.0	11.3	58.6
O	10	326 27.4	16.6	108 38.7	10.5	1 58.3	11.3	58.7
N	11	341 27.3	15.8	123 08.2	10.5	2 09.6	11.3	58.7
D	12	356 27.3	S15 15.0	137 37.7	10.4	S 2 20.9	11.3	58.7
A	13	11 27.3	14.2	152 07.1	10.4	2 32.2	11.3	58.7
Y	14	26 27.2	13.4	166 36.5	10.4	2 43.5	11.2	58.7
	15	41 27.2	·· 12.6	181 05.9	10.4	2 54.7	11.3	58.7
	16	56 27.2	11.9	195 35.3	10.3	3 06.0	11.2	58.7
	17	71 27.1	11.1	210 04.6	10.4	3 17.2	11.3	58.8
	18	86 27.1	S15 10.3	224 34.0	10.3	S 3 28.5	11.2	58.8
	19	101 27.1	09.5	239 03.3	10.2	3 39.7	11.2	58.8
	20	116 27.1	08.7	253 32.5	10.3	3 50.9	11.2	58.8
	21	131 27.0	·· 07.9	268 01.8	10.2	4 02.1	11.1	58.8
	22	146 27.0	07.1	282 31.0	10.2	4 13.2	11.1	58.8
	23	161 27.0	06.3	297 00.2	10.2	4 24.3	11.2	58.8
8	00	176 27.0	S15 05.6	311 29.4	10.1	S 4 35.5	11.0	58.8
	01	191 26.9	04.8	325 58.5	10.2	4 46.5	11.1	58.8
	02	206 26.9	04.0	340 27.7	10.1	4 57.6	11.1	58.9
	03	221 26.9	·· 03.2	354 56.8	10.0	5 08.7	11.0	58.9
	04	236 26.8	02.4	9 25.8	10.1	5 19.7	11.0	58.9
	05	251 26.8	01.6	23 54.9	10.0	5 30.7	10.9	58.9
	06	266 26.8	S15 00.8	38 23.9	9.9	S 5 41.6	11.0	58.9
	07	281 26.8	15 00.0	52 52.8	10.0	5 52.6	10.9	58.9
	08	296 26.8	14 59.2	67 21.8	9.9	6 03.5	10.8	58.9
T	09	311 26.7	·· 58.4	81 50.7	9.9	6 14.3	10.9	58.9
U	10	326 26.7	57.6	96 19.6	9.8	6 25.2	10.8	58.9
E	11	341 26.7	56.9	110 48.4	9.9	6 36.0	10.7	58.9
S	12	356 26.7	S14 56.1	125 17.3	9.8	S 6 46.7	10.8	58.9
D	13	11 26.6	55.3	139 46.1	9.7	6 57.5	10.6	59.0
A	14	26 26.6	54.5	154 14.8	9.7	7 08.1	10.7	59.0
Y	15	41 26.6	·· 53.7	168 43.5	9.7	7 18.8	10.6	59.0
	16	56 26.6	52.9	183 12.2	9.7	7 29.4	10.6	59.0
	17	71 26.5	52.1	197 40.9	9.6	7 40.0	10.5	59.0
	18	86 26.5	S14 51.3	212 09.5	9.6	S 7 50.5	10.5	59.0
	19	101 26.5	50.5	226 38.1	9.5	8 01.0	10.4	59.0
	20	116 26.5	49.7	241 06.6	9.5	8 11.4	10.4	59.0
	21	131 26.5	·· 48.9	255 35.1	9.5	8 21.8	10.4	59.0
	22	146 26.4	48.1	270 03.6	9.4	8 32.2	10.3	59.0
	23	161 26.4	47.3	284 32.0	9.4	8 42.5	10.2	59.0
		S.D. 16.2	d 0.8	S.D. 15.9		16.0		16.1

Lat.	Twilight		Sunrise	Moonrise			
	Naut.	Civil		6	7	8	9
°	h m	h m	h m	h m	h m	h m	h m
N 72	06 48	08 12	09 44	20 11	22 05	24 01	00 01
N 70	06 42	07 57	09 14	20 12	21 58	23 47	25 38
68	06 38	07 46	08 52	20 13	21 53	23 35	25 18
66	06 34	07 36	08 35	20 13	21 49	23 26	25 03
64	06 30	07 27	08 21	20 14	21 45	23 18	24 50
62	06 27	07 20	08 10	20 14	21 42	23 11	24 39
60	06 24	07 14	08 00	20 14	21 39	23 05	24 30
N 58	06 21	07 08	07 51	20 15	21 37	23 00	24 22
56	06 19	07 03	07 43	20 15	21 35	22 55	24 15
54	06 17	06 59	07 36	20 15	21 33	22 51	24 09
52	06 14	06 54	07 30	20 15	21 31	22 47	24 04
50	06 12	06 50	07 25	20 15	21 30	22 44	23 59
45	06 07	06 42	07 13	20 16	21 26	22 37	23 48
N 40	06 02	06 34	07 03	20 16	21 23	22 31	23 39
35	05 58	06 28	06 54	20 17	21 21	22 26	23 31
30	05 53	06 22	06 47	20 17	21 19	22 21	23 24
20	05 44	06 11	06 33	20 17	21 15	22 13	23 13
N 10	05 35	06 00	06 22	20 18	21 12	22 07	23 03
0	05 24	05 49	06 11	20 18	21 09	22 00	22 54
S 10	05 12	05 38	06 00	20 19	21 06	21 54	22 44
20	04 57	05 24	05 48	20 19	21 03	21 47	22 34
30	04 38	05 08	05 34	20 20	20 59	21 40	22 23
35	04 26	04 58	05 26	20 20	20 57	21 36	22 17
40	04 11	04 47	05 16	20 21	20 55	21 31	22 10
45	03 52	04 33	05 05	20 21	20 52	21 25	22 01
S 50	03 28	04 15	04 52	20 22	20 49	21 19	21 51
52	03 16	04 07	04 46	20 22	20 48	21 16	21 46
54	03 01	03 57	04 39	20 22	20 46	21 12	21 41
56	02 44	03 46	04 31	20 22	20 45	21 09	21 36
58	02 23	03 34	04 23	20 23	20 43	21 04	21 29
S 60	01 53	03 19	04 13	20 23	20 41	21 00	21 22

Lat.	Sunset	Twilight		Moonset			
		Civil	Naut.	6	7	8	9
°	h m	h m	h m	h m	h m	h m	h m
N 72	14 46	16 18	17 43	08 27	08 20	08 12	08 04
N 70	15 16	16 32	17 48	08 23	08 22	08 21	08 20
68	15 37	16 44	17 52	08 20	08 24	08 28	08 33
66	15 54	16 54	17 56	08 18	08 26	08 34	08 44
64	16 08	17 02	17 59	08 16	08 27	08 39	08 53
62	16 20	17 09	18 02	08 14	08 28	08 44	09 01
60	16 30	17 15	18 05	08 12	08 30	08 48	09 08
N 58	16 38	17 21	18 08	08 11	08 30	08 51	09 14
56	16 46	17 26	18 10	08 09	08 31	08 54	09 19
54	16 53	17 31	18 13	08 08	08 32	08 57	09 24
52	16 59	17 35	18 15	08 07	08 33	08 59	09 28
50	17 04	17 39	18 17	08 06	08 33	09 02	09 32
45	17 16	17 47	18 22	08 04	08 35	09 07	09 41
N 40	17 26	17 54	18 27	08 02	08 36	09 11	09 48
35	17 35	18 01	18 31	08 00	08 37	09 15	09 54
30	17 42	18 07	18 35	07 59	08 38	09 18	10 00
20	17 55	18 18	18 44	07 56	08 40	09 24	10 09
N 10	18 07	18 28	18 54	07 54	08 41	09 29	10 18
0	18 18	18 39	19 04	07 52	08 42	09 33	10 25
S 10	18 29	18 50	19 16	07 50	08 43	09 38	10 33
20	18 41	19 04	19 31	07 48	08 45	09 43	10 42
30	18 54	19 20	19 50	07 45	08 46	09 48	10 51
35	19 02	19 29	20 02	07 43	08 47	09 52	10 57
40	19 11	19 41	20 16	07 42	08 48	09 55	11 03
45	19 22	19 55	20 35	07 39	08 49	10 00	11 10
S 50	19 35	20 12	20 59	07 37	08 51	10 05	11 19
52	19 41	20 20	21 11	07 36	08 51	10 07	11 23
54	19 48	20 29	21 25	07 35	08 52	10 10	11 28
56	19 56	20 40	21 41	07 33	08 53	10 13	11 33
58	20 04	20 53	22 02	07 32	08 53	10 16	11 39
S 60	20 14	21 07	22 30	07 30	08 54	10 20	11 45

Day	SUN			MOON			
	Eqn. of Time		Mer. Pass.	Mer. Pass.		Age	Phase
	00ʰ	12ʰ		Upper	Lower		
	m s	m s	h m	h m	h m	d	
6	14 05	14 07	12 14	01 40	14 05	18	
7	14 09	14 11	12 14	02 30	14 55	19	◐
8	14 12	14 13	12 14	03 21	15 47	20	

1977 FEBRUARY 9, 10, 11 (WED., THURS., FRI.)

G.M.T.		ARIES	VENUS −4.2		MARS +1.5		JUPITER −2.0		SATURN +0.1	
		G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
d	h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
9	00	138 58.3	134 08.3	N 4 18.6	196 58.6	S21 09.6	88 59.0	N17 32.4	3 19.2	N17 51.8
	01	154 00.8	149 08.9	19.8	211 59.0	09.2	104 01.2	32.5	18 21.8	51.9
	02	169 03.3	164 09.5	20.9	226 59.5	08.8	119 03.5	32.6	33 24.5	51.9
	03	184 05.7	179 10.1	·· 22.1	241 59.9	·· 08.4	134 05.8	·· 32.6	48 27.2	·· 52.0
	04	199 08.2	194 10.6	23.3	257 00.4	08.1	149 08.0	32.7	63 29.8	52.1
	05	214 10.7	209 11.2	24.4	272 00.8	07.7	164 10.3	32.7	78 32.5	52.1
	06	229 13.1	224 11.8	N 4 25.6	287 01.2	S21 07.3	179 12.5	N17 32.8	93 35.2	N17 52.2
W	07	244 15.6	239 12.4	26.8	302 01.7	06.9	194 14.8	32.9	108 37.8	52.2
E	08	259 18.0	254 13.0	27.9	317 02.1	06.5	209 17.1	32.9	123 40.5	52.3
D	09	274 20.5	269 13.6	·· 29.1	332 02.6	·· 06.1	224 19.3	·· 33.0	138 43.2	·· 52.4
N	10	289 23.0	284 14.2	30.2	347 03.0	05.7	239 21.6	33.1	153 45.8	52.4
E	11	304 25.4	299 14.8	31.4	2 03.5	05.3	254 23.8	33.1	168 48.5	52.5
S	12	319 27.9	314 15.4	N 4 32.6	17 03.9	S21 04.9	269 26.1	N17 33.2	183 51.2	N17 52.5
D	13	334 30.4	329 16.0	33.7	32 04.3	04.5	284 28.4	33.2	198 53.8	52.6
A	14	349 32.8	344 16.6	34.9	47 04.8	04.1	299 30.6	33.3	213 56.5	52.7
Y	15	4 35.3	359 17.2	·· 36.1	62 05.2	·· 03.7	314 32.9	·· 33.4	228 59.2	·· 52.7
	16	19 37.8	14 17.9	37.2	77 05.7	03.3	329 35.1	33.4	244 01.8	52.8
	17	34 40.2	29 18.5	38.4	92 06.1	03.0	344 37.4	33.5	259 04.5	52.9
	18	49 42.7	44 19.1	N 4 39.5	107 06.5	S21 02.6	359 39.6	N17 33.6	274 07.2	N17 52.9
	19	64 45.1	59 19.7	40.7	122 07.0	02.2	14 41.9	33.6	289 09.8	53.0
	20	79 47.6	74 20.3	41.9	137 07.4	01.8	29 44.2	33.7	304 12.5	53.0
	21	94 50.1	89 20.9	·· 43.0	152 07.9	·· 01.4	44 46.4	·· 33.8	319 15.2	·· 53.1
	22	109 52.5	104 21.5	44.2	167 08.3	01.0	59 48.7	33.8	334 17.8	53.2
	23	124 55.0	119 22.1	45.3	182 08.8	00.6	74 50.9	33.9	349 20.5	53.2
10	00	139 57.5	134 22.8	N 4 46.5	197 09.2	S21 00.2	89 53.2	N17 33.9	4 23.2	N17 53.3
	01	154 59.9	149 23.4	47.6	212 09.7	20 59.8	104 55.4	34.0	19 25.8	53.3
	02	170 02.4	164 24.0	48.8	227 10.1	59.4	119 57.7	34.1	34 28.5	53.4
	03	185 04.9	179 24.6	·· 50.0	242 10.5	·· 59.0	135 00.0	·· 34.1	49 31.1	·· 53.5
	04	200 07.3	194 25.2	51.1	257 11.0	58.6	150 02.2	34.2	64 33.8	53.5
	05	215 09.8	209 25.9	52.3	272 11.4	58.2	165 04.5	34.3	79 36.5	53.6
	06	230 12.3	224 26.5	N 4 53.4	287 11.9	S20 57.8	180 06.7	N17 34.3	94 39.1	N17 53.6
	07	245 14.7	239 27.1	54.6	302 12.3	57.4	195 09.0	34.4	109 41.8	53.7
T	08	260 17.2	254 27.7	55.7	317 12.8	57.0	210 11.2	34.5	124 44.5	53.8
H	09	275 19.6	269 28.4	·· 56.9	332 13.2	·· 56.6	225 13.5	·· 34.5	139 47.1	·· 53.8
U	10	290 22.1	284 29.0	58.0	347 13.6	56.2	240 15.7	34.6	154 49.8	53.9
R	11	305 24.6	299 29.6	4 59.2	2 14.1	55.8	255 18.0	34.6	169 52.5	53.9
S	12	320 27.0	314 30.2	N 5 00.3	17 14.5	S20 55.4	270 20.2	N17 34.7	184 55.1	N17 54.0
D	13	335 29.5	329 30.9	01.5	32 15.0	55.0	285 22.5	34.8	199 57.8	54.1
A	14	350 32.0	344 31.5	02.6	47 15.4	54.6	300 24.7	34.8	215 00.5	54.1
Y	15	5 34.4	359 32.1	·· 03.8	62 15.9	·· 54.2	315 27.0	·· 34.9	230 03.1	·· 54.2
	16	20 36.9	14 32.8	04.9	77 16.3	53.8	330 29.2	35.0	245 05.8	54.2
	17	35 39.4	29 33.4	06.1	92 16.8	53.4	345 31.5	35.0	260 08.5	54.3
	18	50 41.8	44 34.1	N 5 07.2	107 17.2	S20 53.0	0 33.7	N17 35.1	275 11.1	N17 54.4
	19	65 44.3	59 34.7	08.4	122 17.7	52.5	15 36.0	35.2	290 13.8	54.4
	20	80 46.8	74 35.3	09.5	137 18.1	52.1	30 38.2	35.2	305 16.5	54.5
	21	95 49.2	89 36.0	·· 10.7	152 18.5	·· 51.7	45 40.5	·· 35.3	320 19.1	·· 54.5
	22	110 51.7	104 36.6	11.8	167 19.0	51.3	60 42.7	35.4	335 21.8	54.6
	23	125 54.1	119 37.3	13.0	182 19.4	50.9	75 45.0	35.4	350 24.5	54.7
11	00	140 56.6	134 37.9	N 5 14.1	197 19.9	S20 50.5	90 47.2	N17 35.5	5 27.1	N17 54.7
	01	155 59.1	149 38.6	15.3	212 20.3	50.1	105 49.5	35.6	20 29.8	54.8
	02	171 01.5	164 39.2	16.4	227 20.8	49.7	120 51.7	35.6	35 32.4	54.8
	03	186 04.0	179 39.9	·· 17.6	242 21.2	·· 49.3	135 54.0	·· 35.7	50 35.1	·· 54.9
	04	201 06.5	194 40.5	18.7	257 21.7	48.9	150 56.2	35.7	65 37.8	55.0
	05	216 08.9	209 41.2	19.9	272 22.1	48.5	165 58.5	35.8	80 40.4	55.0
	06	231 11.4	224 41.8	N 5 21.0	287 22.6	S20 48.1	181 00.7	N17 35.9	95 43.1	N17 55.1
	07	246 13.9	239 42.5	22.2	302 23.0	47.7	196 02.9	35.9	110 45.8	55.1
	08	261 16.3	254 43.1	23.3	317 23.5	47.2	211 05.2	36.0	125 48.4	55.2
F	09	276 18.8	269 43.8	·· 24.4	332 23.9	·· 46.8	226 07.4	·· 36.1	140 51.1	·· 55.3
R	10	291 21.2	284 44.4	25.6	347 24.4	46.4	241 09.7	36.1	155 53.8	55.3
I	11	306 23.7	299 45.1	26.7	2 24.8	46.0	256 11.9	36.2	170 56.4	55.4
D	12	321 26.2	314 45.8	N 5 27.9	17 25.2	S20 45.6	271 14.2	N17 36.3	185 59.1	N17 55.4
A	13	336 28.6	329 46.4	29.0	32 25.7	45.2	286 16.4	36.3	201 01.8	55.5
Y	14	351 31.1	344 47.1	30.2	47 26.1	44.8	301 18.7	36.4	216 04.4	55.6
	15	6 33.6	359 47.8	·· 31.3	62 26.6	·· 44.4	316 20.9	·· 36.5	231 07.1	·· 55.6
	16	21 36.0	14 48.4	32.4	77 27.0	43.9	331 23.1	36.5	246 09.7	55.7
	17	36 38.5	29 49.1	33.6	92 27.5	43.5	346 25.4	36.6	261 12.4	55.7
	18	51 41.0	44 49.8	N 5 34.7	107 27.9	S20 43.1	1 27.6	N17 36.7	276 15.1	N17 55.8
	19	66 43.4	59 50.4	35.9	122 28.4	42.7	16 29.9	36.7	291 17.7	55.9
	20	81 45.9	74 51.1	37.0	137 28.8	42.3	31 32.1	36.8	306 20.4	55.9
	21	96 48.4	89 51.8	·· 38.1	152 29.3	·· 41.9	46 34.4	·· 36.9	321 23.1	·· 56.0
	22	111 50.8	104 52.4	39.3	167 29.7	41.5	61 36.6	36.9	336 25.7	56.0
	23	126 53.3	119 53.1	40.4	182 30.2	41.0	76 38.8	37.0	351 28.4	56.1
		h m								
Mer. Pass.		14 37.8	*v* 0.6	*d* 1.2	*v* 0.4	*d* 0.4	*v* 2.3	*d* 0.1	*v* 2.7	*d* 0.1

STARS

Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 39.1	S40 24.1
Achernar	335 47.4	S57 21.5
Acrux	173 39.3	S62 58.2
Adhara	255 33.7	S28 56.7
Aldebaran	291 20.6	N16 27.7
Alioth	166 44.4	N56 04.7
Alkaid	153 20.3	N49 25.3
Al Na'ir	28 18.5	S47 04.4
Alnilam	276 13.9	S 1 13.2
Alphard	218 22.6	S 8 33.8
Alphecca	126 34.2	N26 47.3
Alpheratz	358 12.0	N28 57.9
Altair	62 35.2	N 8 48.4
Ankaa	353 43.0	S42 26.0
Antares	112 59.9	S26 22.8
Arcturus	146 20.6	N19 17.9
Atria	108 26.5	S68 58.9
Avior	234 28.5	S59 26.4
Bellatrix	279 01.2	N 6 19.6
Betelgeuse	271 30.7	N 7 24.0
Canopus	264 07.9	S52 41.3
Capella	281 14.6	N45 58.6
Deneb	49 50.5	N45 11.9
Denebola	183 01.2	N14 41.8
Diphda	349 23.5	S18 06.9
Dubhe	194 24.6	N61 52.2
Elnath	278 47.0	N28 35.3
Eltanin	90 59.2	N51 29.3
Enif	34 14.3	N 9 46.2
Fomalhaut	15 54.4	S29 44.7
Gacrux	172 30.9	S56 59.0
Gienah	176 20.2	S17 25.0
Hadar	149 26.5	S60 15.6
Hamal	328 31.7	N23 21.3
Kaus Aust.	84 20.3	S34 23.6
Kochab	137 18.9	N74 14.6
Markab	14 05.8	N15 04.9
Menkar	314 43.7	N 3 59.9
Menkent	148 39.7	S36 15.4
Miaplacidus	221 44.4	S69 37.5
Mirfak	309 19.5	N49 47.0
Nunki	76 32.4	S26 19.5
Peacock	54 02.8	S56 48.4
Pollux	244 00.8	N28 04.8
Procyon	245 28.0	N 5 16.8
Rasalhague	96 32.0	N12 34.5
Regulus	208 12.2	N12 04.5
Rigel	281 38.2	S 8 13.9
Rigil Kent.	140 28.9	S60 44.2
Sabik	102 44.0	S15 41.8
Schedar	350 12.0	N56 24.9
Shaula	96 59.2	S37 05.1
Sirius	258 57.6	S16 41.4
Spica	158 59.9	S11 02.6
Suhail	223 12.1	S43 20.6
Vega	80 57.8	N38 45.6
Zuben'ubi	137 35.7	S15 56.8

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	354 25.3	15 02
Mars	57 11.7	10 51
Jupiter	309 55.7	17 58
Saturn	224 25.7	23 38

	G.M.T.	SUN G.H.A.	SUN Dec.	MOON G.H.A.	MOON v	MOON Dec.	MOON d	MOON H.P.
	d h	° ′	° ′	° ′	′	° ′	′	′
	9 00	176 26.4	S14 46.5	299 00.4	9.4	S 8 52.7	10.2	59.0
	01	191 26.4	45.7	313 28.8	9.3	9 02.9	10.2	59.0
	02	206 26.4	44.9	327 57.1	9.3	9 13.1	10.1	59.1
	03	221 26.4	· · 44.1	342 25.4	9.2	9 23.2	10.0	59.1
	04	236 26.3	43.3	356 53.6	9.3	9 33.2	10.0	59.1
	05	251 26.3	42.5	11 21.9	9.1	9 43.2	10.0	59.1
	06	266 26.3	S14 41.7	25 50.0	9.2	S 9 53.2	9.9	59.1
W	07	281 26.3	40.9	40 18.2	9.0	10 03.1	9.8	59.1
E	08	296 26.3	40.1	54 46.2	9.1	10 12.9	9.7	59.1
D	09	311 26.3	· · 39.3	69 14.3	9.0	10 22.6	9.7	59.1
N	10	326 26.2	38.5	83 42.3	9.0	10 32.3	9.7	59.1
E	11	341 26.2	37.7	98 10.3	8.9	10 42.0	9.6	59.1
S	12	356 26.2	S14 36.9	112 38.2	8.9	S10 51.6	9.5	59.1
D	13	11 26.2	36.1	127 06.1	8.8	11 01.1	9.4	59.1
A	14	26 26.2	35.3	141 33.9	8.8	11 10.5	9.4	59.1
Y	15	41 26.2	· · 34.5	156 01.7	8.8	11 19.9	9.3	59.1
	16	56 26.2	33.7	170 29.5	8.7	11 29.2	9.3	59.1
	17	71 26.1	32.9	184 57.2	8.7	11 38.5	9.2	59.1
	18	86 26.1	S14 32.1	199 24.9	8.6	S11 47.7	9.1	59.1
	19	101 26.1	31.2	213 52.5	8.6	11 56.8	9.0	59.1
	20	116 26.1	30.4	228 20.1	8.6	12 05.8	9.0	59.2
	21	131 26.1	· · 29.6	242 47.7	8.5	12 14.8	8.9	59.2
	22	146 26.1	28.8	257 15.2	8.4	12 23.7	8.8	59.2
	23	161 26.1	28.0	271 42.6	8.5	12 32.5	8.8	59.2
	10 00	176 26.1	S14 27.2	286 10.1	8.3	S12 41.3	8.7	59.2
	01	191 26.0	26.4	300 37.4	8.4	12 50.0	8.6	59.2
	02	206 26.0	25.6	315 04.8	8.3	12 58.6	8.5	59.2
	03	221 26.0	· · 24.8	329 32.1	8.2	13 07.1	8.4	59.2
	04	236 26.0	24.0	343 59.3	8.2	13 15.5	8.4	59.2
	05	251 26.0	23.2	358 26.5	8.2	13 23.9	8.3	59.2
	06	266 26.0	S14 22.3	12 53.7	8.1	S13 32.2	8.2	59.2
	07	281 26.0	21.5	27 20.8	8.1	13 40.4	8.1	59.2
T	08	296 26.0	20.7	41 47.9	8.0	13 48.5	8.0	59.2
H	09	311 26.0	· · 19.9	56 14.9	8.0	13 56.5	7.9	59.2
U	10	326 26.0	19.1	70 41.9	8.0	14 04.4	7.9	59.2
R	11	341 26.0	18.3	85 08.9	7.9	14 12.3	7.8	59.2
S	12	356 25.9	S14 17.5	99 35.8	7.8	S14 20.1	7.7	59.2
D	13	11 25.9	16.7	114 02.6	7.9	14 27.8	7.6	59.2
A	14	26 25.9	15.8	128 29.5	7.7	14 35.4	7.5	59.2
Y	15	41 25.9	· · 15.0	142 56.2	7.8	14 42.9	7.4	59.2
	16	56 25.9	14.2	157 23.0	7.7	14 50.3	7.3	59.2
	17	71 25.9	13.4	171 49.7	7.6	14 57.6	7.2	59.2
	18	86 25.9	S14 12.6	186 16.3	7.6	S15 04.8	7.2	59.2
	19	101 25.9	11.8	200 42.9	7.6	15 12.0	7.0	59.2
	20	116 25.9	10.9	215 09.5	7.6	15 19.0	6.9	59.2
	21	131 25.9	· · 10.1	229 36.1	7.4	15 25.9	6.9	59.2
	22	146 25.9	09.3	244 02.5	7.5	15 32.8	6.7	59.2
	23	161 25.9	08.5	258 29.0	7.4	15 39.5	6.7	59.2
	11 00	176 25.9	S14 07.7	272 55.4	7.4	S15 46.2	6.5	59.2
	01	191 25.9	06.8	287 21.8	7.3	15 52.7	6.5	59.2
	02	206 25.9	06.0	301 48.1	7.3	15 59.2	6.4	59.2
	03	221 25.9	· · 05.2	316 14.4	7.3	16 05.6	6.2	59.2
	04	236 25.9	04.4	330 40.7	7.2	16 11.8	6.2	59.2
	05	251 25.9	03.6	345 06.9	7.2	16 18.0	6.0	59.2
	06	266 25.9	S14 02.7	359 33.1	7.1	S16 24.0	6.0	59.2
	07	281 25.9	01.9	13 59.2	7.1	16 30.0	5.8	59.2
	08	296 25.9	01.1	28 25.3	7.1	16 35.8	5.7	59.2
F	09	311 25.9	14 00.3	42 51.4	7.0	16 41.5	5.6	59.2
R	10	326 25.9	13 59.5	57 17.4	7.0	16 47.1	5.6	59.2
I	11	341 25.9	58.6	71 43.4	7.0	16 52.7	5.4	59.2
D	12	356 25.9	S13 57.8	86 09.4	6.9	S16 58.1	5.3	59.2
A	13	11 25.9	57.0	100 35.3	6.9	17 03.4	5.2	59.2
Y	14	26 25.9	56.2	115 01.2	6.9	17 08.6	5.1	59.2
	15	41 25.9	· · 55.3	129 27.1	6.8	17 13.7	4.9	59.2
	16	56 25.9	54.5	143 52.9	6.8	17 18.6	4.9	59.2
	17	71 25.9	53.7	158 18.7	6.8	17 23.5	4.8	59.2
	18	86 25.9	S13 52.9	172 44.5	6.7	S17 28.3	4.6	59.2
	19	101 25.9	52.0	187 10.2	6.7	17 32.9	4.5	59.2
	20	116 25.9	51.2	201 35.9	6.7	17 37.4	4.4	59.2
	21	131 25.9	· · 50.4	216 01.6	6.7	17 41.8	4.3	59.2
	22	146 25.9	49.5	230 27.3	6.6	17 46.1	4.2	59.2
	23	161 25.9	48.7	244 52.9	6.6	17 50.3	4.1	59.2
		S.D. 16.2	d 0.8	S.D. 16.1		16.1		16.1

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 9	Moonrise 10	Moonrise 11	Moonrise 12
°	h m	h m	h m	h m	h m	h m	h m
N 72	06 36	07 58	09 24	00 01	02 03	04 17	■
N 70	06 32	07 45	08 59	25 38	01 38	03 30	05 19
68	06 28	07 35	08 40	25 18	01 18	03 00	04 34
66	06 25	07 26	08 24	25 03	01 03	02 37	04 04
64	06 22	07 19	08 12	24 50	00 50	02 20	03 42
62	06 20	07 13	08 01	24 39	00 39	02 05	03 24
60	06 18	07 07	07 52	24 30	00 30	01 53	03 10
N 58	06 15	07 02	07 44	24 22	00 22	01 42	02 57
56	06 13	06 57	07 37	24 15	00 15	01 33	02 46
54	06 11	06 53	07 31	24 09	00 09	01 25	02 37
52	06 10	06 49	07 25	24 04	00 04	01 18	02 28
50	06 08	06 46	07 20	23 59	25 11	01 11	02 21
45	06 03	06 38	07 09	23 48	24 57	00 57	02 05
N 40	05 59	06 31	06 59	23 39	24 46	00 46	01 51
35	05 55	06 25	06 51	23 31	24 36	00 36	01 40
30	05 51	06 20	06 44	23 24	24 28	00 28	01 30
20	05 43	06 09	06 32	23 13	24 13	00 13	01 13
N 10	05 34	05 59	06 21	23 03	24 00	00 00	00 59
0	05 25	05 49	06 11	22 54	23 49	24 45	00 45
S 10	05 13	05 39	06 00	22 44	23 37	24 32	00 32
20	04 59	05 26	05 49	22 34	23 24	24 17	00 17
30	04 41	05 11	05 36	22 23	23 10	24 01	00 01
35	04 29	05 02	05 29	22 17	23 02	23 51	24 45
40	04 15	04 51	05 20	22 10	22 52	23 40	24 33
45	03 58	04 38	05 10	22 01	22 41	23 27	24 20
S 50	03 35	04 21	04 57	21 51	22 28	23 12	24 03
52	03 24	04 13	04 52	21 46	22 22	23 04	23 55
54	03 10	04 04	04 45	21 41	22 15	22 56	23 46
56	02 55	03 54	04 38	21 36	22 08	22 47	23 36
58	02 35	03 43	04 30	21 29	21 59	22 37	23 25
S 60	02 10	03 29	04 21	21 22	21 50	22 26	23 12

Lat.	Sunset	Twilight Civil	Twilight Naut.	Moonset 9	Moonset 10	Moonset 11	Moonset 12
°	h m	h m	h m	h m	h m	h m	h m
N 72	15 06	16 32	17 55	08 04	07 53	07 35	■
N 70	15 31	16 45	17 59	08 20	08 20	08 23	08 33
68	15 50	16 55	18 02	08 33	08 41	08 54	09 19
66	16 05	17 03	18 05	08 44	08 58	09 17	09 49
64	16 18	17 11	18 07	08 53	09 11	09 36	10 11
62	16 29	17 17	18 10	09 01	09 23	09 51	10 29
60	16 38	17 23	18 12	09 08	09 32	10 03	10 44
N 58	16 46	17 28	18 14	09 14	09 41	10 14	10 57
56	16 53	17 32	18 16	09 19	09 48	10 24	11 08
54	16 59	17 36	18 18	09 24	09 55	10 32	11 18
52	17 04	17 40	18 20	09 28	10 01	10 40	11 26
50	17 10	17 43	18 22	09 32	10 07	10 47	11 34
45	17 21	17 51	18 26	09 41	10 19	11 02	11 51
N 40	17 30	17 58	18 30	09 48	10 29	11 14	12 04
35	17 38	18 04	18 34	09 54	10 37	11 24	12 16
30	17 45	18 09	18 38	10 00	10 45	11 33	12 26
20	17 57	18 19	18 46	10 09	10 58	11 49	12 43
N 10	18 08	18 29	18 54	10 18	11 09	12 02	12 58
0	18 18	18 39	19 04	10 25	11 20	12 15	13 13
S 10	18 28	18 50	19 15	10 33	11 30	12 28	13 27
20	18 39	19 02	19 29	10 42	11 42	12 42	13 42
30	18 52	19 17	19 47	10 51	11 55	12 58	13 59
35	18 59	19 26	19 58	10 57	12 02	13 07	14 09
40	19 08	19 37	20 12	11 03	12 11	13 17	14 21
45	19 18	19 50	20 29	11 10	12 21	13 29	14 34
S 50	19 30	20 06	20 52	11 19	12 33	13 44	14 51
52	19 36	20 14	21 03	11 23	12 39	13 51	14 59
54	19 42	20 23	21 16	11 28	12 45	13 59	15 07
56	19 49	20 33	21 31	11 33	12 52	14 08	15 17
58	19 57	20 44	21 50	11 39	13 00	14 18	15 28
S 60	20 06	20 57	22 14	11 45	13 09	14 29	15 41

Day	SUN Eqn. of Time 00ʰ	SUN Eqn. of Time 12ʰ	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
	m s	m s	h m	h m	h m	d	
9	14 14	14 15	12 14	04 13	16 39	21	◑
10	14 16	14 16	12 14	05 06	17 34	22	
11	14 16	14 16	12 14	06 02	18 30	23	

1977 FEBRUARY 12, 13, 14 (SAT., SUN., MON.)

G.M.T.		ARIES	VENUS −4.2		MARS +1.5		JUPITER −1.9		SATURN +0.1	
		G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
d	h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
12	00	141 55.7	134 53.8	N 5 41.5	197 30.6	S20 40.6	91 41.1	N17 37.1	6 31.1	N17 56.2
	01	156 58.2	149 54.5	42.7	212 31.1	40.2	106 43.3	37.1	21 33.7	56.2
	02	172 00.7	164 55.1	43.8	227 31.5	39.8	121 45.6	37.2	36 36.4	56.3
	03	187 03.1	179 55.8	·· 45.0	242 32.0	·· 39.4	136 47.8	·· 37.3	51 39.1	·· 56.3
	04	202 05.6	194 56.5	46.1	257 32.4	39.0	151 50.0	37.3	66 41.7	56.4
	05	217 08.1	209 57.2	47.2	272 32.9	38.5	166 52.3	37.4	81 44.4	56.5
	06	232 10.5	224 57.9	N 5 48.4	287 33.3	S20 38.1	181 54.5	N17 37.5	96 47.0	N17 56.5
	07	247 13.0	239 58.6	49.5	302 33.8	37.7	196 56.8	37.5	111 49.7	56.6
S	08	262 15.5	254 59.2	50.6	317 34.2	37.3	211 59.0	37.6	126 52.4	56.6
A	09	277 17.9	269 59.9	·· 51.8	332 34.7	·· 36.9	227 01.2	·· 37.7	141 55.0	·· 56.7
T	10	292 20.4	285 00.6	52.9	347 35.1	36.4	242 03.5	37.7	156 57.7	56.8
U	11	307 22.9	300 01.3	54.0	2 35.6	36.0	257 05.7	37.8	172 00.4	56.8
R	12	322 25.3	315 02.0	N 5 55.2	17 36.0	S20 35.6	272 07.9	N17 37.9	187 03.0	N17 56.9
D	13	337 27.8	330 02.7	56.3	32 36.5	35.2	287 10.2	38.0	202 05.7	56.9
A	14	352 30.2	345 03.4	57.4	47 36.9	34.8	302 12.4	38.0	217 08.3	57.0
Y	15	7 32.7	0 04.1	·· 58.5	62 37.4	·· 34.3	317 14.6	·· 38.1	232 11.0	·· 57.0
	16	22 35.2	15 04.8	5 59.7	77 37.8	33.9	332 16.9	38.2	247 13.7	57.1
	17	37 37.6	30 05.5	6 00.8	92 38.3	33.5	347 19.1	38.2	262 16.3	57.2
	18	52 40.1	45 06.2	N 6 01.9	107 38.7	S20 33.1	2 21.4	N17 38.3	277 19.0	N17 57.2
	19	67 42.6	60 06.9	03.1	122 39.2	32.6	17 23.6	38.4	292 21.7	57.3
	20	82 45.0	75 07.6	04.2	137 39.7	32.2	32 25.8	38.4	307 24.3	57.3
	21	97 47.5	90 08.3	·· 05.3	152 40.1	·· 31.8	47 28.1	·· 38.5	322 27.0	·· 57.4
	22	112 50.0	105 09.0	06.4	167 40.6	31.4	62 30.3	38.6	337 29.7	57.5
	23	127 52.4	120 09.7	07.6	182 41.0	30.9	77 32.5	38.6	352 32.3	57.5
13	00	142 54.9	135 10.4	N 6 08.7	197 41.5	S20 30.5	92 34.8	N17 38.7	7 35.0	N17 57.6
	01	157 57.3	150 11.1	09.8	212 41.9	30.1	107 37.0	38.8	22 37.6	57.6
	02	172 59.8	165 11.8	10.9	227 42.4	29.7	122 39.2	38.8	37 40.3	57.7
	03	188 02.3	180 12.5	·· 12.1	242 42.8	·· 29.2	137 41.5	·· 38.9	52 43.0	·· 57.8
	04	203 04.7	195 13.2	13.2	257 43.3	28.8	152 43.7	39.0	67 45.6	57.8
	05	218 07.2	210 14.0	14.3	272 43.7	28.4	167 45.9	39.0	82 48.3	57.9
	06	233 09.7	225 14.7	N 6 15.4	287 44.2	S20 27.9	182 48.1	N17 39.1	97 51.0	N17 57.9
	07	248 12.1	240 15.4	16.6	302 44.6	27.5	197 50.4	39.2	112 53.6	58.0
	08	263 14.6	255 16.1	17.7	317 45.1	27.1	212 52.6	39.3	127 56.3	58.1
S	09	278 17.1	270 16.8	·· 18.8	332 45.5	·· 26.7	227 54.8	·· 39.3	142 58.9	·· 58.1
U	10	293 19.5	285 17.6	19.9	347 46.0	26.2	242 57.1	39.4	158 01.6	58.2
N	11	308 22.0	300 18.3	21.0	2 46.5	25.8	257 59.3	39.5	173 04.3	58.2
D	12	323 24.5	315 19.0	N 6 22.2	17 46.9	S20 25.4	273 01.5	N17 39.5	188 06.9	N17 58.3
A	13	338 26.9	330 19.7	23.3	32 47.4	24.9	288 03.8	39.6	203 09.6	58.3
Y	14	353 29.4	345 20.4	24.4	47 47.8	24.5	303 06.0	39.7	218 12.3	58.4
	15	8 31.8	0 21.2	·· 25.5	62 48.3	·· 24.1	318 08.2	·· 39.7	233 14.9	·· 58.5
	16	23 34.3	15 21.9	26.6	77 48.7	23.6	333 10.4	39.8	248 17.6	58.5
	17	38 36.8	30 22.6	27.8	92 49.2	23.2	348 12.7	39.9	263 20.2	58.6
	18	53 39.2	45 23.4	N 6 28.9	107 49.6	S20 22.8	3 14.9	N17 39.9	278 22.9	N17 58.6
	19	68 41.7	60 24.1	30.0	122 50.1	22.3	18 17.1	40.0	293 25.6	58.7
	20	83 44.2	75 24.8	31.1	137 50.5	21.9	33 19.3	40.1	308 28.2	58.8
	21	98 46.6	90 25.6	·· 32.2	152 51.0	·· 21.5	48 21.6	·· 40.2	323 30.9	·· 58.8
	22	113 49.1	105 26.3	33.3	167 51.5	21.0	63 23.8	40.2	338 33.5	58.9
	23	128 51.6	120 27.0	34.4	182 51.9	20.6	78 26.0	40.3	353 36.2	58.9
14	00	143 54.0	135 27.8	N 6 35.6	197 52.4	S20 20.2	93 28.3	N17 40.4	8 38.9	N17 59.0
	01	158 56.5	150 28.5	36.7	212 52.8	19.7	108 30.5	40.4	23 41.5	59.1
	02	173 59.0	165 29.3	37.8	227 53.3	19.3	123 32.7	40.5	38 44.2	59.1
	03	189 01.4	180 30.0	·· 38.9	242 53.7	·· 18.9	138 34.9	·· 40.6	53 46.9	·· 59.2
	04	204 03.9	195 30.8	40.0	257 54.2	18.4	153 37.2	40.7	68 49.5	59.2
	05	219 06.3	210 31.5	41.1	272 54.7	18.0	168 39.4	40.7	83 52.2	59.3
	06	234 08.8	225 32.2	N 6 42.2	287 55.1	S20 17.6	183 41.6	N17 40.8	98 54.8	N17 59.3
	07	249 11.3	240 33.0	43.3	302 55.6	17.1	198 43.8	40.9	113 57.5	59.4
	08	264 13.7	255 33.7	44.5	317 56.0	16.7	213 46.0	40.9	129 00.2	59.5
M	09	279 16.2	270 34.5	·· 45.6	332 56.5	·· 16.2	228 48.3	·· 41.0	144 02.8	·· 59.5
O	10	294 18.7	285 35.3	46.7	347 56.9	15.8	243 50.5	41.1	159 05.5	59.6
N	11	309 21.1	300 36.0	47.8	2 57.4	15.4	258 52.7	41.1	174 08.1	59.6
D	12	324 23.6	315 36.8	N 6 48.9	17 57.9	S20 14.9	273 54.9	N17 41.2	189 10.8	N17 59.7
A	13	339 26.1	330 37.5	50.0	32 58.3	14.5	288 57.2	41.3	204 13.5	59.8
Y	14	354 28.5	345 38.3	51.1	47 58.8	14.0	303 59.4	41.4	219 16.1	59.8
	15	9 31.0	0 39.0	·· 52.2	62 59.2	·· 13.6	319 01.6	·· 41.4	234 18.8	·· 59.9
	16	24 33.4	15 39.8	53.3	77 59.7	13.2	334 03.8	41.5	249 21.4	17 59.9
	17	39 35.9	30 40.6	54.4	93 00.1	12.7	349 06.0	41.6	264 24.1	18 00.0
	18	54 38.4	45 41.3	N 6 55.5	108 00.6	S20 12.3	4 08.3	N17 41.6	279 26.8	N18 00.0
	19	69 40.8	60 42.1	56.6	123 01.1	11.8	19 10.5	41.7	294 29.4	00.1
	20	84 43.3	75 42.9	57.7	138 01.5	11.4	34 12.7	41.8	309 32.1	00.2
	21	99 45.8	90 43.6	·· 58.8	153 02.0	·· 11.0	49 14.9	·· 41.9	324 34.7	·· 00.2
	22	114 48.2	105 44.4	6 59.9	168 02.4	10.5	64 17.1	41.9	339 37.4	00.3
	23	129 50.7	120 45.2	7 01.0	183 02.9	10.1	79 19.4	42.0	354 40.1	00.3
Mer. Pass.		h m 14 26.0	*v* 0.7	*d* 1.1	*v* 0.5	*d* 0.4	*v* 2.2	*d* 0.1	*v* 2.7	*d* 0.1

STARS		
Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 39.1	S40 24.1
Achernar	335 47.4	S57 21.5
Acrux	173 39.3	S62 58.2
Adhara	255 33.7	S28 56.7
Aldebaran	291 20.6	N16 27.7
Alioth	166 44.3	N56 04.7
Alkaid	153 20.2	N49 25.3
Al Na'ir	28 18.5	S47 04.3
Alnilam	276 13.9	S 1 13.2
Alphard	218 22.6	S 8 33.8
Alphecca	126 34.2	N26 47.3
Alpheratz	358 12.1	N28 57.9
Altair	62 35.2	N 8 48.4
Ankaa	353 43.0	S42 26.0
Antares	112 59.9	S26 22.8
Arcturus	146 20.6	N19 17.9
Atria	108 26.4	S68 58.9
Avior	234 28.5	S59 26.4
Bellatrix	279 01.2	N 6 19.6
Betelgeuse	271 30.7	N 7 24.0
Canopus	264 07.9	S52 41.4
Capella	281 14.6	N45 58.6
Deneb	49 50.5	N45 11.9
Denebola	183 01.2	N14 41.8
Diphda	349 23.5	S18 06.9
Dubhe	194 24.5	N61 52.2
Elnath	278 47.0	N28 35.3
Eltanin	90 59.2	N51 29.3
Enif	34 14.3	N 9 46.2
Fomalhaut	15 54.4	S29 44.7
Gacrux	172 30.9	S56 59.0
Gienah	176 20.2	S17 25.0
Hadar	149 26.4	S60 15.6
Hamal	328 31.7	N23 21.3
Kaus Aust.	84 20.3	S34 23.6
Kochab	137 18.8	N74 14.6
Markab	14 05.8	N15 04.9
Menkar	314 43.7	N 3 59.9
Menkent	148 39.7	S36 15.4
Miaplacidus	221 44.4	S69 37.6
Mirfak	309 19.5	N49 47.0
Nunki	76 32.4	S26 19.4
Peacock	54 02.8	S56 48.4
Pollux	244 00.8	N28 04.8
Procyon	245 28.0	N 5 16.8
Rasalhague	96 32.0	N12 34.5
Regulus	208 12.2	N12 04.5
Rigel	281 38.2	S 8 13.9
Rigil Kent.	140 28.8	S60 44.2
Sabik	102 44.0	S15 41.8
Schedar	350 12.1	N56 24.9
Shaula	96 59.2	S37 05.1
Sirius	258 57.6	S16 41.4
Spica	158 59.9	S11 02.6
Suhail	223 12.1	S43 20.6
Vega	80 57.8	N38 45.6
Zuben'ubi	137 35.6	S15 56.8

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	352 15.5	14 59
Mars	54 46.6	10 49
Jupiter	309 39.9	17 47
Saturn	224 40.1	23 26

1977 FEBRUARY 12, 13, 14 (SAT., SUN., MON.)

G.M.T.		SUN G.H.A.	SUN Dec.	MOON G.H.A.	MOON *v*	MOON Dec.	MOON *d*	MOON H.P.
	d h	° ′	° ′	° ′	′	° ′	′	′
	12 00	176 25.9	S13 47.9	259 18.5	6.6	S17 54.4	3.9	59.2
	01	191 25.9	47.1	273 44.1	6.5	17 58.3	3.9	59.2
	02	206 25.9	46.2	288 09.6	6.5	18 02.2	3.7	59.2
	03	221 25.9	·· 45.4	302 35.1	6.5	18 05.9	3.6	59.2
	04	236 25.9	44.6	317 00.6	6.5	18 09.5	3.5	59.2
	05	251 25.9	43.7	331 26.1	6.5	18 13.0	3.3	59.2
	06	266 26.0	S13 42.9	345 51.6	6.4	S18 16.3	3.3	59.2
	07	281 26.0	42.1	0 17.0	6.4	18 19.6	3.1	59.2
S	08	296 26.0	41.2	14 42.4	6.4	18 22.7	3.0	59.2
A	09	311 26.0	·· 40.4	29 07.8	6.4	18 25.7	2.9	59.2
T	10	326 26.0	39.6	43 33.2	6.4	18 28.6	2.8	59.2
U	11	341 26.0	38.7	57 58.6	6.3	18 31.4	2.6	59.2
R	12	356 26.0	S13 37.9	72 23.9	6.4	S18 34.0	2.6	59.2
D	13	11 26.0	37.1	86 49.3	6.3	18 36.6	2.4	59.1
A	14	26 26.0	36.2	101 14.6	6.3	18 39.0	2.2	59.1
Y	15	41 26.0	·· 35.4	115 39.9	6.3	18 41.2	2.2	59.1
	16	56 26.0	34.6	130 05.2	6.3	18 43.4	2.0	59.1
	17	71 26.0	33.7	144 30.5	6.3	18 45.4	2.0	59.1
	18	86 26.1	S13 32.9	158 55.8	6.2	S18 47.4	1.8	59.1
	19	101 26.1	32.1	173 21.0	6.3	18 49.2	1.6	59.1
	20	116 26.1	31.2	187 46.3	6.2	18 50.8	1.6	59.1
	21	131 26.1	·· 30.4	202 11.5	6.3	18 52.4	1.4	59.1
	22	146 26.1	29.6	216 36.8	6.2	18 53.8	1.3	59.1
	23	161 26.1	28.7	231 02.0	6.2	18 55.1	1.2	59.1
	13 00	176 26.1	S13 27.9	245 27.2	6.3	S18 56.3	1.0	59.1
	01	191 26.1	27.0	259 52.5	6.2	18 57.3	1.0	59.1
	02	206 26.2	26.2	274 17.7	6.2	18 58.3	0.8	59.1
	03	221 26.2	·· 25.4	288 42.9	6.2	18 59.1	0.6	59.1
	04	236 26.2	24.5	303 08.1	6.3	18 59.7	0.6	59.1
	05	251 26.2	23.7	317 33.4	6.2	19 00.3	0.4	59.1
	06	266 26.2	S13 22.8	331 58.6	6.2	S19 00.7	0.3	59.1
	07	281 26.2	22.0	346 23.8	6.3	19 01.0	0.2	59.0
	08	296 26.2	21.2	0 49.1	6.2	19 01.2	0.1	59.0
S	09	311 26.3	·· 20.3	15 14.3	6.3	19 01.3	0.1	59.0
U	10	326 26.3	19.5	29 39.6	6.2	19 01.2	0.2	59.0
N	11	341 26.3	18.6	44 04.8	6.3	19 01.0	0.3	59.0
D	12	356 26.3	S13 17.8	58 30.1	6.3	S19 00.7	0.4	59.0
A	13	11 26.3	17.0	72 55.4	6.2	19 00.3	0.6	59.0
Y	14	26 26.3	16.1	87 20.6	6.3	18 59.7	0.7	59.0
	15	41 26.4	·· 15.3	101 45.9	6.4	18 59.0	0.8	59.0
	16	56 26.4	14.4	116 11.3	6.3	18 58.2	0.9	59.0
	17	71 26.4	13.6	130 36.6	6.3	18 57.3	1.0	59.0
	18	86 26.4	S13 12.7	145 01.9	6.4	S18 56.3	1.2	59.0
	19	101 26.4	11.9	159 27.3	6.3	18 55.1	1.3	59.0
	20	116 26.4	11.0	173 52.6	6.4	18 53.8	1.4	58.9
	21	131 26.5	·· 10.2	188 18.0	6.5	18 52.4	1.6	58.9
	22	146 26.5	09.4	202 43.5	6.4	18 50.8	1.6	58.9
	23	161 26.5	08.5	217 08.9	6.4	18 49.2	1.8	58.9
	14 00	176 26.5	S13 07.7	231 34.3	6.5	S18 47.4	1.9	58.9
	01	191 26.5	06.8	245 59.8	6.5	18 45.5	2.0	58.9
	02	206 26.6	06.0	260 25.3	6.5	18 43.5	2.2	58.9
	03	221 26.6	·· 05.1	274 50.8	6.6	18 41.3	2.2	58.9
	04	236 26.6	04.3	289 16.4	6.6	18 39.1	2.4	58.9
	05	251 26.6	03.4	303 42.0	6.6	18 36.7	2.5	58.9
	06	266 26.7	S13 02.6	318 07.6	6.6	S18 34.2	2.6	58.9
	07	281 26.7	01.7	332 33.2	6.7	18 31.6	2.8	58.8
	08	296 26.7	00.9	346 58.9	6.7	18 28.8	2.8	58.8
M	09	311 26.7	13 00.0	1 24.6	6.7	18 26.0	3.0	58.8
O	10	326 26.7	12 59.2	15 50.3	6.7	18 23.0	3.1	58.8
N	11	341 26.8	58.3	30 16.0	6.8	18 19.9	3.2	58.8
D	12	356 26.8	S12 57.5	44 41.8	6.9	S18 16.7	3.3	58.8
A	13	11 26.8	56.6	59 07.7	6.8	18 13.4	3.4	58.8
Y	14	26 26.8	55.8	73 33.5	6.9	18 10.0	3.6	58.8
	15	41 26.9	·· 54.9	87 59.4	7.0	18 06.4	3.6	58.8
	16	56 26.9	54.1	102 25.4	6.9	18 02.8	3.8	58.7
	17	71 26.9	53.2	116 51.3	7.0	17 59.0	3.9	58.7
	18	86 26.9	S12 52.4	131 17.3	7.1	S17 55.1	4.0	58.7
	19	101 27.0	51.5	145 43.4	7.1	17 51.1	4.1	58.7
	20	116 27.0	50.6	160 09.5	7.1	17 47.0	4.2	58.7
	21	131 27.0	·· 49.8	174 35.6	7.2	17 42.8	4.3	58.7
	22	146 27.0	48.9	189 01.8	7.2	17 38.5	4.5	58.7
	23	161 27.1	48.1	203 28.0	7.2	17 34.0	4.5	58.6
		S.D. 16.2	*d* 0.8	S.D.	16.1	16.1		16.0

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 12	Moonrise 13	Moonrise 14	Moonrise 15
°	h m	h m	h m	h m	h m	h m	h m
N 72	06 23	07 44	09 06	■	■	■	08 25
N 70	06 21	07 33	08 44	05 19	06 45	07 23	07 34
68	06 18	07 24	08 27	04 34	05 49	06 36	07 02
66	06 16	07 17	08 13	04 04	05 16	06 06	06 38
64	06 14	07 10	08 02	03 42	04 51	05 43	06 19
62	06 12	07 05	07 52	03 24	04 32	05 25	06 04
60	06 11	07 00	07 44	03 10	04 16	05 10	05 51
N 58	06 09	06 55	07 37	02 57	04 03	04 57	05 40
56	06 07	06 51	07 30	02 46	03 51	04 46	05 30
54	06 06	06 47	07 24	02 37	03 41	04 36	05 21
52	06 04	06 44	07 19	02 28	03 32	04 27	05 14
50	06 03	06 41	07 14	02 21	03 24	04 20	05 07
45	05 59	06 34	07 04	02 05	03 07	04 03	04 52
N 40	05 56	06 28	06 56	01 51	02 53	03 49	04 40
35	05 53	06 22	06 48	01 40	02 41	03 38	04 29
30	05 49	06 17	06 42	01 30	02 31	03 27	04 20
20	05 42	06 08	06 30	01 13	02 13	03 10	04 04
N 10	05 34	05 59	06 20	00 59	01 57	02 55	03 50
0	05 25	05 50	06 11	00 45	01 43	02 40	03 37
S 10	05 14	05 39	06 01	00 32	01 28	02 26	03 24
20	05 01	05 28	05 51	00 17	01 13	02 11	03 10
30	04 44	05 14	05 39	00 01	00 55	01 54	02 54
35	04 33	05 05	05 32	24 45	00 45	01 44	02 45
40	04 20	04 55	05 24	24 33	00 33	01 32	02 34
45	04 03	04 42	05 14	24 20	00 20	01 18	02 22
S 50	03 42	04 27	05 03	24 03	00 03	01 02	02 07
52	03 31	04 20	04 57	23 55	24 54	00 54	02 00
54	03 19	04 11	04 52	23 46	24 45	00 45	01 52
56	03 05	04 02	04 45	23 36	24 35	00 35	01 43
58	02 47	03 51	04 38	23 25	24 24	00 24	01 33
S 60	02 25	03 39	04 29	23 12	24 11	00 11	01 22

Lat.	Sunset	Twilight Civil	Twilight Naut.	Moonset 12	Moonset 13	Moonset 14	Moonset 15
°	h m	h m	h m	h m	h m	h m	h m
N 72	15 24	16 46	18 07	■	■	■	11 26
N 70	15 46	16 57	18 10	08 33	09 08	10 30	12 16
68	16 03	17 06	18 12	09 19	10 04	11 17	12 48
66	16 16	17 13	18 14	09 49	10 37	11 47	13 11
64	16 28	17 19	18 16	10 11	11 02	12 09	13 29
62	16 37	17 25	18 17	10 29	11 21	12 27	13 44
60	16 46	17 30	18 19	10 44	11 37	12 42	13 57
N 58	16 53	17 34	18 21	10 57	11 50	12 55	14 07
56	16 59	17 38	18 22	11 08	12 02	13 06	14 17
54	17 05	17 42	18 23	11 18	12 12	13 15	14 25
52	17 10	17 45	18 25	11 26	12 21	13 24	14 32
50	17 15	17 48	18 26	11 34	12 29	13 31	14 39
45	17 25	17 55	18 30	11 51	12 46	13 48	14 53
N 40	17 33	18 01	18 33	12 04	13 00	14 01	15 05
35	17 41	18 07	18 36	12 16	13 12	14 12	15 15
30	17 47	18 12	18 40	12 26	13 23	14 22	15 24
20	17 58	18 21	18 47	12 43	13 40	14 39	15 38
N 10	18 08	18 30	18 55	12 58	13 56	14 54	15 51
0	18 18	18 39	19 04	13 13	14 10	15 08	16 03
S 10	18 27	18 49	19 14	13 27	14 25	15 21	16 16
20	18 37	19 00	19 27	13 42	14 40	15 36	16 28
30	18 49	19 14	19 44	13 59	14 58	15 53	16 43
35	18 56	19 23	19 55	14 09	15 08	16 02	16 51
40	19 04	19 33	20 08	14 21	15 20	16 13	17 01
45	19 13	19 45	20 24	14 34	15 34	16 26	17 12
S 50	19 25	20 00	20 45	14 51	15 51	16 42	17 25
52	19 30	20 07	20 55	14 59	15 58	16 49	17 32
54	19 36	20 16	21 07	15 07	16 07	16 57	17 39
56	19 42	20 25	21 21	15 17	16 17	17 07	17 46
58	19 49	20 35	21 38	15 28	16 28	17 17	17 55
S 60	19 58	20 48	21 59	15 41	16 41	17 29	18 05

Day	SUN Eqn. of Time 00ʰ	SUN Eqn. of Time 12ʰ	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
	m s	m s	h m	h m	h m	d	
12	14 16	14 16	12 14	06 59	19 28	24	◑
13	14 16	14 15	12 14	07 57	20 25	25	
14	14 14	14 13	12 14	08 54	21 22	26	

1977 FEBRUARY 15, 16, 17 (TUES., WED., THURS.)

G.M.T.		ARIES	VENUS −4.3		MARS +1.5		JUPITER −1.9		SATURN +0.1	
		G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
d	h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
15	00	144 53.2	135 45.9	N 7 02.1	198 03.4	S20 09.6	94 21.6	N17 42.1	9 42.7	N18 00.4
	01	159 55.6	150 46.7	03.2	213 03.8	09.2	109 23.8	42.1	24 45.4	00.5
	02	174 58.1	165 47.5	04.3	228 04.3	08.7	124 26.0	42.2	39 48.0	00.5
	03	190 00.6	180 48.3	· · 05.4	243 04.7	· · 08.3	139 28.2	· · 42.3	54 50.7	· · 00.6
	04	205 03.0	195 49.1	06.5	258 05.2	07.8	154 30.4	42.4	69 53.4	00.6
	05	220 05.5	210 49.8	07.6	273 05.7	07.4	169 32.7	42.4	84 56.0	00.7
	06	235 07.9	225 50.6	N 7 08.7	288 06.1	S20 06.9	184 34.9	N17 42.5	99 58.7	N18 00.7
	07	250 10.4	240 51.4	09.8	303 06.6	06.5	199 37.1	42.6	115 01.3	00.8
	08	265 12.9	255 52.2	10.9	318 07.0	06.1	214 39.3	42.7	130 04.0	00.9
T	09	280 15.3	270 53.0	· · 12.0	333 07.5	· · 05.6	229 41.5	· · 42.7	145 06.7	· · 00.9
U	10	295 17.8	285 53.8	13.1	348 08.0	05.2	244 43.7	42.8	160 09.3	01.0
E	11	310 20.3	300 54.5	14.2	3 08.4	04.7	259 46.0	42.9	175 12.0	01.0
S	12	325 22.7	315 55.3	N 7 15.3	18 08.9	S20 04.3	274 48.2	N17 42.9	190 14.6	N18 01.1
D	13	340 25.2	330 56.1	16.4	33 09.3	03.8	289 50.4	43.0	205 17.3	01.1
A	14	355 27.7	345 56.9	17.5	48 09.8	03.4	304 52.6	43.1	220 20.0	01.2
Y	15	10 30.1	0 57.7	· · 18.6	63 10.3	· · 02.9	319 54.8	· · 43.2	235 22.6	· · 01.3
	16	25 32.6	15 58.5	19.7	78 10.7	02.5	334 57.0	43.2	250 25.3	01.3
	17	40 35.1	30 59.3	20.8	93 11.2	02.0	349 59.2	43.3	265 27.9	01.4
	18	55 37.5	46 00.1	N 7 21.9	108 11.7	S20 01.6	5 01.5	N17 43.4	280 30.6	N18 01.4
	19	70 40.0	61 00.9	23.0	123 12.1	01.1	20 03.7	43.5	295 33.3	01.5
	20	85 42.4	76 01.7	24.1	138 12.6	00.7	35 05.9	43.5	310 35.9	01.6
	21	100 44.9	91 02.5	· · 25.1	153 13.0	20 00.2	50 08.1	· · 43.6	325 38.6	· · 01.6
	22	115 47.4	106 03.3	26.2	168 13.5	19 59.8	65 10.3	43.7	340 41.2	01.7
	23	130 49.8	121 04.1	27.3	183 14.0	59.3	80 12.5	43.7	355 43.9	01.7
16	00	145 52.3	136 04.9	N 7 28.4	198 14.4	S19 58.8	95 14.7	N17 43.8	10 46.6	N18 01.8
	01	160 54.8	151 05.7	29.5	213 14.9	58.4	110 16.9	43.9	25 49.2	01.8
	02	175 57.2	166 06.5	30.6	228 15.4	57.9	125 19.1	44.0	40 51.9	01.9
	03	190 59.7	181 07.4	· · 31.7	243 15.8	· · 57.5	140 21.4	· · 44.0	55 54.5	· · 02.0
	04	206 02.2	196 08.2	32.8	258 16.3	57.0	155 23.6	44.1	70 57.2	02.0
	05	221 04.6	211 09.0	33.8	273 16.8	56.6	170 25.8	44.2	85 59.8	02.1
	06	236 07.1	226 09.8	N 7 34.9	288 17.2	S19 56.1	185 28.0	N17 44.3	101 02.5	N18 02.1
W	07	251 09.5	241 10.6	36.0	303 17.7	55.7	200 30.2	44.3	116 05.2	02.2
E	08	266 12.0	256 11.4	37.1	318 18.1	55.2	215 32.4	44.4	131 07.8	02.2
D	09	281 14.5	271 12.3	· · 38.2	333 18.6	· · 54.7	230 34.6	· · 44.5	146 10.5	· · 02.3
N	10	296 16.9	286 13.1	39.3	348 19.1	54.3	245 36.8	44.6	161 13.1	02.4
E	11	311 19.4	301 13.9	40.3	3 19.5	53.8	260 39.0	44.6	176 15.8	02.4
S	12	326 21.9	316 14.7	N 7 41.4	18 20.0	S19 53.4	275 41.2	N17 44.7	191 18.5	N18 02.5
D	13	341 24.3	331 15.6	42.5	33 20.5	52.9	290 43.4	44.8	206 21.1	02.5
A	14	356 26.8	346 16.4	43.6	48 20.9	52.5	305 45.7	44.9	221 23.8	02.6
Y	15	11 29.3	1 17.2	· · 44.7	63 21.4	· · 52.0	320 47.9	· · 44.9	236 26.4	· · 02.6
	16	26 31.7	16 18.1	45.7	78 21.9	51.5	335 50.1	45.0	251 29.1	02.7
	17	41 34.2	31 18.9	46.8	93 22.3	51.1	350 52.3	45.1	266 31.7	02.8
	18	56 36.7	46 19.7	N 7 47.9	108 22.8	S19 50.6	5 54.5	N17 45.2	281 34.4	N18 02.8
	19	71 39.1	61 20.6	49.0	123 23.3	50.2	20 56.7	45.2	296 37.1	02.9
	20	86 41.6	76 21.4	50.1	138 23.7	49.7	35 58.9	45.3	311 39.7	02.9
	21	101 44.0	91 22.2	· · 51.1	153 24.2	· · 49.2	51 01.1	· · 45.4	326 42.4	· · 03.0
	22	116 46.5	106 23.1	52.2	168 24.7	48.8	66 03.3	45.5	341 45.0	03.0
	23	131 49.0	121 23.9	53.3	183 25.1	48.3	81 05.5	45.5	356 47.7	03.1
17	00	146 51.4	136 24.8	N 7 54.4	198 25.6	S19 47.9	96 07.7	N17 45.6	11 50.3	N18 03.2
	01	161 53.9	151 25.6	55.4	213 26.1	47.4	111 09.9	45.7	26 53.0	03.2
	02	176 56.4	166 26.5	56.5	228 26.5	46.9	126 12.1	45.8	41 55.7	03.3
	03	191 58.8	181 27.3	· · 57.6	243 27.0	· · 46.5	141 14.3	· · 45.8	56 58.3	· · 03.3
	04	207 01.3	196 28.1	58.6	258 27.5	46.0	156 16.5	45.9	72 01.0	03.4
	05	222 03.8	211 29.0	7 59.7	273 27.9	45.5	171 18.7	46.0	87 03.6	03.4
	06	237 06.2	226 29.9	N 8 00.8	288 28.4	S19 45.1	186 20.9	N17 46.1	102 06.3	N18 03.5
	07	252 08.7	241 30.7	01.9	303 28.9	44.6	201 23.1	46.1	117 08.9	03.5
T	08	267 11.2	256 31.6	02.9	318 29.3	44.1	216 25.3	46.2	132 11.6	03.6
H	09	282 13.6	271 32.4	· · 04.0	333 29.8	· · 43.7	231 27.5	· · 46.3	147 14.3	· · 03.7
U	10	297 16.1	286 33.3	05.1	348 30.3	43.2	246 29.7	46.4	162 16.9	03.7
R	11	312 18.5	301 34.1	06.1	3 30.7	42.7	261 31.9	46.4	177 19.6	03.8
S	12	327 21.0	316 35.0	N 8 07.2	18 31.2	S19 42.3	276 34.1	N17 46.5	192 22.2	N18 03.8
D	13	342 23.5	331 35.9	08.3	33 31.7	41.8	291 36.3	46.6	207 24.9	03.9
A	14	357 25.9	346 36.7	09.3	48 32.1	41.3	306 38.5	46.7	222 27.5	03.9
Y	15	12 28.4	1 37.6	· · 10.4	63 32.6	· · 40.9	321 40.7	· · 46.7	237 30.2	· · 04.0
	16	27 30.9	16 38.5	11.5	78 33.1	40.4	336 42.9	46.8	252 32.9	04.1
	17	42 33.3	31 39.3	12.5	93 33.5	39.9	351 45.1	46.9	267 35.5	04.1
	18	57 35.8	46 40.2	N 8 13.6	108 34.0	S19 39.5	6 47.3	N17 47.0	282 38.2	N18 04.2
	19	72 38.3	61 41.1	14.7	123 34.5	39.0	21 49.5	47.0	297 40.8	04.2
	20	87 40.7	76 42.0	15.7	138 35.0	38.5	36 51.7	47.1	312 43.5	04.3
	21	102 43.2	91 42.8	· · 16.8	153 35.4	· · 38.1	51 53.9	· · 47.2	327 46.1	· · 04.3
	22	117 45.6	106 43.7	17.8	168 35.9	37.6	66 56.1	47.3	342 48.8	04.4
	23	132 48.1	121 44.6	18.9	183 36.4	37.1	81 58.3	47.3	357 51.4	04.5
Mer. Pass.		h m 14 14.2	*v* 0.8	*d* 1.1	*v* 0.5	*d* 0.5	*v* 2.2	*d* 0.1	*v* 2.7	*d* 0.1

STARS

Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 39.2	S40 24.1
Achernar	335 47.4	S57 21.4
Acrux	173 39.3	S62 58.3
Adhara	255 33.7	S28 56.8
Aldebaran	291 20.7	N16 27.7
Alioth	166 44.3	N56 04.7
Alkaid	153 20.2	N49 25.3
Al Na'ir	28 18.5	S47 04.3
Alnilam	276 13.9	S 1 13.2
Alphard	218 22.6	S 8 33.8
Alphecca	126 34.1	N26 47.3
Alpheratz	358 12.1	N28 57.9
Altair	62 35.1	N 8 48.4
Ankaa	353 43.0	S42 26.0
Antares	112 59.9	S26 22.8
Arcturus	146 20.5	N19 17.9
Atria	108 26.4	S68 58.9
Avior	234 28.5	S59 26.4
Bellatrix	279 01.2	N 6 19.6
Betelgeuse	271 30.7	N 7 24.0
Canopus	264 07.9	S52 41.4
Capella	281 14.6	N45 58.6
Deneb	49 50.5	N45 11.9
Denebola	183 01.2	N14 41.8
Diphda	349 23.5	S18 06.9
Dubhe	194 24.5	N61 52.2
Elnath	278 47.0	N28 35.3
Eltanin	90 59.1	N51 29.3
Enif	34 14.2	N 9 46.2
Fomalhaut	15 54.4	S29 44.7
Gacrux	172 30.9	S56 59.0
Gienah	176 20.1	S17 25.0
Hadar	149 26.4	S60 15.6
Hamal	328 31.7	N23 21.3
Kaus Aust.	84 20.3	S34 23.6
Kochab	137 18.8	N74 14.6
Markab	14 05.8	N15 04.9
Menkar	314 43.7	N 3 59.9
Menkent	148 39.6	S36 15.4
Miaplacidus	221 44.4	S69 37.6
Mirfak	309 19.5	N49 47.0
Nunki	76 32.4	S26 19.4
Peacock	54 02.7	S56 48.4
Pollux	244 00.8	N28 04.8
Procyon	245 28.0	N 5 16.8
Rasalhague	96 32.0	N12 34.5
Regulus	208 12.2	N12 04.5
Rigel	281 38.2	S 8 13.9
Rigil Kent.	140 28.8	S60 44.2
Sabik	102 44.0	S15 41.8
Schedar	350 12.1	N56 24.9
Shaula	96 59.2	S37 05.1
Sirius	258 57.6	S16 41.4
Spica	158 59.9	S11 02.6
Suhail	223 12.1	S43 20.6
Vega	80 57.7	N38 45.6
Zuben'ubi	137 35.6	S15 56.8

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	350 12.6	14 55
Mars	52 22.1	10 47
Jupiter	309 22.4	17 36
Saturn	224 54.3	23 13

	G.M.T.	SUN		MOON				
		G.H.A.	Dec.	G.H.A.	*v*	Dec.	*d*	H.P.
	d h	° ′	° ′	° ′	′	° ′	′	′
	15 00	176 27.1	S12 47.2	217 54.2	7.3	S17 29.5	4.7	58.6
	01	191 27.1	46.4	232 20.5	7.4	17 24.8	4.7	58.6
	02	206 27.2	45.5	246 46.9	7.4	17 20.1	4.9	58.6
	03	221 27.2	·· 44.7	261 13.3	7.4	17 15.2	4.9	58.6
	04	236 27.2	43.8	275 39.7	7.5	17 10.3	5.1	58.6
	05	251 27.2	42.9	290 06.2	7.5	17 05.2	5.2	58.6
	06	266 27.3	S12 42.1	304 32.7	7.6	S17 00.0	5.3	58.6
	07	281 27.3	41.2	318 59.3	7.7	16 54.7	5.3	58.5
T	08	296 27.3	40.4	333 26.0	7.6	16 49.4	5.5	58.5
U	09	311 27.4	·· 39.5	347 52.6	7.8	16 43.9	5.6	58.5
E	10	326 27.4	38.6	2 19.4	7.7	16 38.3	5.7	58.5
S	11	341 27.4	37.8	16 46.1	7.9	16 32.6	5.7	58.5
D	12	356 27.5	S12 36.9	31 13.0	7.9	S16 26.9	5.9	58.5
A	13	11 27.5	36.1	45 39.9	7.9	16 21.0	6.0	58.4
Y	14	26 27.5	35.2	60 06.8	8.0	16 15.0	6.0	58.4
	15	41 27.6	·· 34.3	74 33.8	8.0	16 09.0	6.2	58.4
	16	56 27.6	33.5	89 00.8	8.1	16 02.8	6.2	58.4
	17	71 27.6	32.6	103 27.9	8.2	15 56.6	6.4	58.4
	18	86 27.7	S12 31.8	117 55.1	8.2	S15 50.2	6.4	58.4
	19	101 27.7	30.9	132 22.3	8.2	15 43.8	6.5	58.4
	20	116 27.7	30.0	146 49.5	8.3	15 37.3	6.7	58.3
	21	131 27.8	·· 29.2	161 16.8	8.4	15 30.6	6.7	58.3
	22	146 27.8	28.3	175 44.2	8.4	15 23.9	6.8	58.3
	23	161 27.8	27.4	190 11.6	8.5	15 17.1	6.8	58.3
	16 00	176 27.9	S12 26.6	204 39.1	8.6	S15 10.3	7.0	58.3
	01	191 27.9	25.7	219 06.7	8.6	15 03.3	7.0	58.3
	02	206 27.9	24.8	233 34.3	8.6	14 56.3	7.2	58.2
	03	221 28.0	·· 24.0	248 01.9	8.7	14 49.1	7.2	58.2
	04	236 28.0	23.1	262 29.6	8.8	14 41.9	7.3	58.2
	05	251 28.0	22.3	276 57.4	8.8	14 34.6	7.4	58.2
	06	266 28.1	S12 21.4	291 25.2	8.9	S14 27.2	7.4	58.2
W	07	281 28.1	20.5	305 53.1	8.9	14 19.8	7.6	58.1
E	08	296 28.1	19.7	320 21.0	9.0	14 12.2	7.6	58.1
D	09	311 28.2	·· 18.8	334 49.0	9.1	14 04.6	7.7	58.1
N	10	326 28.2	17.9	349 17.1	9.1	13 56.9	7.7	58.1
E	11	341 28.3	17.0	3 45.2	9.2	13 49.2	7.9	58.1
S	12	356 28.3	S12 16.2	18 13.4	9.2	S13 41.3	7.9	58.0
D	13	11 28.3	15.3	32 41.6	9.3	13 33.4	8.0	58.0
A	14	26 28.4	14.4	47 09.9	9.4	13 25.4	8.0	58.0
Y	15	41 28.4	·· 13.6	61 38.3	9.4	13 17.4	8.1	58.0
	16	56 28.5	12.7	76 06.7	9.5	13 09.3	8.2	58.0
	17	71 28.5	11.8	90 35.2	9.5	13 01.1	8.3	57.9
	18	86 28.5	S12 11.0	105 03.7	9.6	S12 52.8	8.3	57.9
	19	101 28.6	10.1	119 32.3	9.7	12 44.5	8.4	57.9
	20	116 28.6	09.2	134 01.0	9.7	12 36.1	8.5	57.9
	21	131 28.7	·· 08.3	148 29.7	9.7	12 27.6	8.5	57.9
	22	146 28.7	07.5	162 58.4	9.9	12 19.1	8.6	57.8
	23	161 28.7	06.6	177 27.3	9.9	12 10.5	8.6	57.8
	17 00	176 28.8	S12 05.7	191 56.2	9.9	S12 01.9	8.8	57.8
	01	191 28.8	04.9	206 25.1	10.0	11 53.1	8.7	57.8
	02	206 28.9	04.0	220 54.1	10.1	11 44.4	8.9	57.8
	03	221 28.9	·· 03.1	235 23.2	10.1	11 35.5	8.8	57.7
	04	236 29.0	02.2	249 52.3	10.2	11 26.7	9.0	57.7
	05	251 29.0	01.4	264 21.5	10.2	11 17.7	9.0	57.7
	06	266 29.0	S12 00.5	278 50.7	10.3	S11 08.7	9.0	57.7
	07	281 29.1	11 59.6	293 20.0	10.4	10 59.7	9.1	57.7
T	08	296 29.1	58.7	307 49.4	10.4	10 50.6	9.2	57.6
H	09	311 29.2	·· 57.9	322 18.8	10.5	10 41.4	9.2	57.6
U	10	326 29.2	57.0	336 48.3	10.5	10 32.2	9.2	57.6
R	11	341 29.3	56.1	351 17.8	10.6	10 23.0	9.3	57.6
S	12	356 29.3	S11 55.2	5 47.4	10.6	S10 13.7	9.4	57.5
D	13	11 29.4	54.4	20 17.0	10.7	10 04.3	9.4	57.5
A	14	26 29.4	53.5	34 46.7	10.8	9 54.9	9.4	57.5
Y	15	41 29.5	·· 52.6	49 16.5	10.8	9 45.5	9.5	57.5
	16	56 29.5	51.7	63 46.3	10.9	9 36.0	9.5	57.5
	17	71 29.6	50.9	78 16.2	10.9	9 26.5	9.6	57.4
	18	86 29.6	S11 50.0	92 46.1	11.0	S 9 16.9	9.6	57.4
	19	101 29.6	49.1	107 16.1	11.0	9 07.3	9.7	57.4
	20	116 29.7	48.2	121 46.1	11.1	8 57.6	9.6	57.4
	21	131 29.7	·· 47.3	136 16.2	11.1	8 48.0	9.8	57.3
	22	146 29.8	46.5	150 46.3	11.2	8 38.2	9.7	57.3
	23	161 29.8	45.6	165 16.5	11.3	8 28.5	9.8	57.3
		S.D. 16.2	*d* 0.9	S.D. 15.9		15.8		15.7

Lat.	Twilight		Sunrise	Moonrise			
	Naut.	Civil		15	16	17	18
°	h m	h m	h m	h m	h m	h m	h m
N 72	06 11	07 30	08 48	08 25	08 06	07 55	07 47
N 70	06 09	07 21	08 29	07 34	07 37	07 38	07 37
68	06 08	07 13	08 14	07 02	07 15	07 23	07 29
66	06 07	07 07	08 02	06 38	06 58	07 12	07 22
64	06 06	07 01	07 52	06 19	06 44	07 02	07 16
62	06 05	06 56	07 43	06 04	06 32	06 54	07 10
60	06 04	06 52	07 36	05 51	06 22	06 46	07 06
N 58	06 02	06 48	07 29	05 40	06 13	06 40	07 02
56	06 01	06 45	07 23	05 30	06 05	06 34	06 58
54	06 00	06 42	07 18	05 21	05 58	06 29	06 55
52	05 59	06 39	07 13	05 14	05 52	06 24	06 52
50	05 58	06 36	07 09	05 07	05 46	06 20	06 50
45	05 55	06 30	07 00	04 52	05 34	06 11	06 44
N 40	05 53	06 24	06 52	04 40	05 24	06 03	06 39
35	05 50	06 19	06 45	04 29	05 15	05 57	06 35
30	05 47	06 15	06 39	04 20	05 08	05 51	06 31
20	05 40	06 06	06 29	04 04	04 54	05 41	06 25
N 10	05 33	05 58	06 20	03 50	04 43	05 32	06 19
0	05 25	05 50	06 11	03 37	04 32	05 24	06 14
S 10	05 15	05 40	06 02	03 24	04 21	05 16	06 08
20	05 03	05 29	05 52	03 10	04 09	05 07	06 03
30	04 47	05 16	05 41	02 54	03 56	04 57	05 56
35	04 36	05 08	05 35	02 45	03 48	04 51	05 52
40	04 24	04 59	05 27	02 34	03 39	04 44	05 48
45	04 09	04 47	05 19	02 22	03 29	04 36	05 43
S 50	03 49	04 33	05 08	02 07	03 16	04 27	05 37
52	03 39	04 26	05 03	02 00	03 10	04 22	05 34
54	03 28	04 18	04 58	01 52	03 04	04 18	05 31
56	03 14	04 10	04 52	01 43	02 56	04 12	05 28
58	02 59	04 00	04 45	01 33	02 48	04 06	05 24
S 60	02 39	03 48	04 37	01 22	02 39	04 00	05 20

Lat.	Sunset	Twilight		Moonset			
		Civil	Naut.	15	16	17	18
°	h m	h m	h m	h m	h m	h m	h m
N 72	15 41	17 00	18 20	11 26	13 38	15 36	17 26
N 70	16 00	17 09	18 21	12 16	14 06	15 52	17 34
68	16 15	17 16	18 22	12 48	14 26	16 05	17 40
66	16 27	17 23	18 23	13 11	14 43	16 15	17 46
64	16 37	17 28	18 24	13 29	14 56	16 24	17 51
62	16 46	17 33	18 25	13 44	15 07	16 31	17 55
60	16 53	17 37	18 26	13 57	15 17	16 38	17 58
N 58	17 00	17 41	18 27	14 07	15 25	16 43	18 01
56	17 06	17 44	18 28	14 17	15 32	16 48	18 04
54	17 11	17 48	18 29	14 25	15 38	16 53	18 06
52	17 16	17 51	18 30	14 32	15 44	16 57	18 08
50	17 20	17 53	18 31	14 39	15 49	17 00	18 10
45	17 29	17 59	18 34	14 53	16 01	17 08	18 15
N 40	17 37	18 05	18 36	15 05	16 10	17 15	18 18
35	17 44	18 09	18 39	15 15	16 18	17 20	18 21
30	17 49	18 14	18 42	15 24	16 25	17 25	18 24
20	18 00	18 22	18 48	15 38	16 37	17 34	18 29
N 10	18 09	18 30	18 55	15 51	16 47	17 41	18 33
0	18 18	18 39	19 03	16 03	16 57	17 48	18 37
S 10	18 26	18 48	19 13	16 16	17 07	17 55	18 40
20	18 36	18 58	19 25	16 28	17 17	18 02	18 44
30	18 47	19 12	19 41	16 43	17 29	18 10	18 49
35	18 53	19 19	19 51	16 51	17 35	18 15	18 52
40	19 00	19 29	20 03	17 01	17 43	18 20	18 54
45	19 09	19 40	20 18	17 12	17 52	18 26	18 58
S 50	19 19	19 54	20 38	17 25	18 02	18 34	19 02
52	19 24	20 01	20 48	17 32	18 07	18 37	19 04
54	19 29	20 08	20 59	17 39	18 12	18 41	19 05
56	19 35	20 17	21 12	17 46	18 18	18 45	19 08
58	19 42	20 27	21 27	17 55	18 25	18 49	19 10
S 60	19 49	20 38	21 46	18 05	18 32	18 54	19 13

Day	SUN			MOON			
	Eqn. of Time		Mer. Pass.	Mer. Pass.		Age	Phase
	00ʰ	12ʰ		Upper	Lower		
	m s	m s	h m	h m	h m	d	
15	14 12	14 10	12 14	09 50	22 18	27	●
16	14 09	14 07	12 14	10 44	23 11	28	
17	14 05	14 03	12 14	11 36	24 01	29	

1977 FEBRUARY 18, 19, 20 (FRI., SAT., SUN.)

G.M.T.	ARIES	VENUS −4.3		MARS +1.5		JUPITER −1.9		SATURN +0.1	
	G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
d h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
18 00	147 50.6	136 45.5	N 8 20.0	198 36.8	S19 36.7	97 00.5	N17 47.4	12 54.1	N18 04.5
01	162 53.0	151 46.4	21.0	213 37.3	36.2	112 02.7	47.5	27 56.8	04.6
02	177 55.5	166 47.2	22.1	228 37.8	35.7	127 04.9	47.6	42 59.4	04.6
03	192 58.0	181 48.1	· · 23.1	243 38.2	· · 35.2	142 07.1	· · 47.6	58 02.1	· · 04.7
04	208 00.4	196 49.0	24.2	258 38.7	34.8	157 09.3	47.7	73 04.7	04.7
05	223 02.9	211 49.9	25.2	273 39.2	34.3	172 11.5	47.8	88 07.4	04.8
06	238 05.4	226 50.8	N 8 26.3	288 39.7	S19 33.8	187 13.7	N17 47.9	103 10.0	N18 04.8
07	253 07.8	241 51.7	27.4	303 40.1	33.3	202 15.9	48.0	118 12.7	04.9
08	268 10.3	256 52.6	28.4	318 40.6	32.9	217 18.1	48.0	133 15.3	05.0
F 09	283 12.8	271 53.5	· · 29.5	333 41.1	· · 32.4	232 20.3	· · 48.1	148 18.0	· · 05.0
R 10	298 15.2	286 54.4	30.5	348 41.5	31.9	247 22.5	48.2	163 20.7	05.1
I 11	313 17.7	301 55.3	31.6	3 42.0	31.5	262 24.7	48.3	178 23.3	05.1
D 12	328 20.1	316 56.2	N 8 32.6	18 42.5	S19 31.0	277 26.9	N17 48.3	193 26.0	N18 05.2
A 13	343 22.6	331 57.1	33.7	33 43.0	30.5	292 29.0	48.4	208 28.6	05.2
Y 14	358 25.1	346 58.0	34.7	48 43.4	30.0	307 31.2	48.5	223 31.3	05.3
15	13 27.5	1 58.9	· · 35.8	63 43.9	· · 29.5	322 33.4	· · 48.6	238 33.9	· · 05.3
16	28 30.0	16 59.8	36.8	78 44.4	29.1	337 35.6	48.7	253 36.6	05.4
17	43 32.5	32 00.7	37.9	93 44.9	28.6	352 37.8	48.7	268 39.2	05.5
18	58 34.9	47 01.6	N 8 38.9	108 45.3	S19 28.1	7 40.0	N17 48.8	283 41.9	N18 05.5
19	73 37.4	62 02.5	40.0	123 45.8	27.6	22 42.2	48.9	298 44.5	05.6
20	88 39.9	77 03.4	41.0	138 46.3	27.2	37 44.4	49.0	313 47.2	05.6
21	103 42.3	92 04.3	· · 42.1	153 46.7	· · 26.7	52 46.6	· · 49.0	328 49.9	· · 05.7
22	118 44.8	107 05.3	43.1	168 47.2	26.2	67 48.8	49.1	343 52.5	05.7
23	133 47.3	122 06.2	44.2	183 47.7	25.7	82 51.0	49.2	358 55.2	05.8
19 00	148 49.7	137 07.1	N 8 45.2	198 48.2	S19 25.2	97 53.2	N17 49.3	13 57.8	N18 05.8
01	163 52.2	152 08.0	46.2	213 48.6	24.8	112 55.3	49.4	29 00.5	05.9
02	178 54.6	167 08.9	47.3	228 49.1	24.3	127 57.5	49.4	44 03.1	06.0
03	193 57.1	182 09.9	· · 48.3	243 49.6	· · 23.8	142 59.7	· · 49.5	59 05.8	· · 06.0
04	208 59.6	197 10.8	49.4	258 50.1	23.3	158 01.9	49.6	74 08.4	06.1
05	224 02.0	212 11.7	50.4	273 50.5	22.8	173 04.1	49.7	89 11.1	06.1
06	239 04.5	227 12.7	N 8 51.4	288 51.0	S19 22.4	188 06.3	N17 49.7	104 13.7	N18 06.2
07	254 07.0	242 13.6	52.5	303 51.5	21.9	203 08.5	49.8	119 16.4	06.2
S 08	269 09.4	257 14.5	53.5	318 52.0	21.4	218 10.7	49.9	134 19.0	06.3
A 09	284 11.9	272 15.5	· · 54.6	333 52.4	· · 20.9	233 12.9	· · 50.0	149 21.7	· · 06.3
T 10	299 14.4	287 16.4	55.6	348 52.9	20.4	248 15.0	50.1	164 24.3	06.4
U 11	314 16.8	302 17.3	56.6	3 53.4	19.9	263 17.2	50.1	179 27.0	06.5
R 12	329 19.3	317 18.3	N 8 57.7	18 53.9	S19 19.5	278 19.4	N17 50.2	194 29.7	N18 06.5
D 13	344 21.7	332 19.2	58.7	33 54.3	19.0	293 21.6	50.3	209 32.3	06.6
A 14	359 24.2	347 20.2	8 59.7	48 54.8	18.5	308 23.8	50.4	224 35.0	06.6
Y 15	14 26.7	2 21.1	9 00.8	63 55.3	· · 18.0	323 26.0	· · 50.5	239 37.6	· · 06.7
16	29 29.1	17 22.0	01.8	78 55.8	17.5	338 28.2	50.5	254 40.3	06.7
17	44 31.6	32 23.0	02.8	93 56.2	17.0	353 30.3	50.6	269 42.9	06.8
18	59 34.1	47 23.9	N 9 03.9	108 56.7	S19 16.5	8 32.5	N17 50.7	284 45.6	N18 06.8
19	74 36.5	62 24.9	04.9	123 57.2	16.1	23 34.7	50.8	299 48.2	06.9
20	89 39.0	77 25.8	05.9	138 57.7	15.6	38 36.9	50.8	314 50.9	07.0
21	104 41.5	92 26.8	· · 07.0	153 58.2	· · 15.1	53 39.1	· · 50.9	329 53.5	· · 07.0
22	119 43.9	107 27.8	08.0	168 58.6	14.6	68 41.3	51.0	344 56.2	07.1
23	134 46.4	122 28.7	09.0	183 59.1	14.1	83 43.4	51.1	359 58.8	07.1
20 00	149 48.9	137 29.7	N 9 10.1	198 59.6	S19 13.6	98 45.6	N17 51.2	15 01.5	N18 07.2
01	164 51.3	152 30.6	11.1	214 00.1	13.1	113 47.8	51.2	30 04.1	07.2
02	179 53.8	167 31.6	12.1	229 00.5	12.6	128 50.0	51.3	45 06.8	07.3
03	194 56.2	182 32.6	· · 13.1	244 01.0	· · 12.2	143 52.2	· · 51.4	60 09.4	· · 07.3
04	209 58.7	197 33.5	14.2	259 01.5	11.7	158 54.4	51.5	75 12.1	07.4
05	225 01.2	212 34.5	15.2	274 02.0	11.2	173 56.5	51.6	90 14.7	07.4
06	240 03.6	227 35.5	N 9 16.2	289 02.5	S19 10.7	188 58.7	N17 51.6	105 17.4	N18 07.5
07	255 06.1	242 36.5	17.2	304 02.9	10.2	204 00.9	51.7	120 20.0	07.6
08	270 08.6	257 37.4	18.3	319 03.4	09.7	219 03.1	51.8	135 22.7	07.6
S 09	285 11.0	272 38.4	· · 19.3	334 03.9	· · 09.2	234 05.3	· · 51.9	150 25.3	· · 07.7
U 10	300 13.5	287 39.4	20.3	349 04.4	08.7	249 07.4	52.0	165 28.0	07.7
N 11	315 16.0	302 40.4	21.3	4 04.9	08.2	264 09.6	52.0	180 30.6	07.8
D 12	330 18.4	317 41.3	N 9 22.3	19 05.3	S19 07.7	279 11.8	N17 52.1	195 33.3	N18 07.8
A 13	345 20.9	332 42.3	23.4	34 05.8	07.2	294 14.0	52.2	210 35.9	07.9
Y 14	0 23.4	347 43.3	24.4	49 06.3	06.8	309 16.2	52.3	225 38.6	07.9
15	15 25.8	2 44.3	· · 25.4	64 06.8	· · 06.3	324 18.3	· · 52.4	240 41.2	· · 08.0
16	30 28.3	17 45.3	26.4	79 07.3	05.8	339 20.5	52.4	255 43.9	08.0
17	45 30.7	32 46.3	27.4	94 07.7	05.3	354 22.7	52.5	270 46.6	08.1
18	60 33.2	47 47.3	N 9 28.4	109 08.2	S19 04.8	9 24.9	N17 52.6	285 49.2	N18 08.2
19	75 35.7	62 48.3	29.5	124 08.7	04.3	24 27.1	52.7	300 51.9	08.2
20	90 38.1	77 49.3	30.5	139 09.2	03.8	39 29.2	52.8	315 54.5	08.3
21	105 40.6	92 50.3	· · 31.5	154 09.7	· · 03.3	54 31.4	· · 52.8	330 57.2	· · 08.3
22	120 43.1	107 51.3	32.5	169 10.1	02.8	69 33.6	52.9	345 59.8	08.4
23	135 45.5	122 52.3	33.5	184 10.6	02.3	84 35.8	53.0	1 02.5	08.4
Mer. Pass.	h m 14 02.4	v 0.9	d 1.0	v 0.5	d 0.5	v 2.2	d 0.1	v 2.7	d 0.1

STARS

Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 39.2	S40 24.1
Achernar	335 47.4	S57 21.4
Acrux	173 39.2	S62 58.3
Adhara	255 33.7	S28 56.8
Aldebaran	291 20.7	N16 27.7
Alioth	166 44.3	N56 04.7
Alkaid	153 20.2	N49 25.3
Al Na'ir	28 18.4	S47 04.3
Alnilam	276 13.9	S 1 13.2
Alphard	218 22.6	S 8 33.8
Alphecca	126 34.1	N26 47.3
Alpheratz	358 12.1	N28 57.9
Altair	62 35.1	N 8 48.4
Ankaa	353 43.0	S42 26.0
Antares	112 59.8	S26 22.8
Arcturus	146 20.5	N19 17.9
Atria	108 26.3	S68 58.9
Avior	234 28.5	S59 26.4
Bellatrix	279 01.2	N 6 19.6
Betelgeuse	271 30.7	N 7 24.0
Canopus	264 07.9	S52 41.4
Capella	281 14.7	N45 58.6
Deneb	49 50.5	N45 11.9
Denebola	183 01.2	N14 41.8
Diphda	349 23.5	S18 06.9
Dubhe	194 24.5	N61 52.2
Elnath	278 47.0	N28 35.3
Eltanin	90 59.1	N51 29.3
Enif	34 14.2	N 9 46.2
Fomalhaut	15 54.4	S29 44.7
Gacrux	172 30.9	S56 59.1
Gienah	176 20.1	S17 25.0
Hadar	149 26.4	S60 15.6
Hamal	328 31.8	N23 21.3
Kaus Aust.	84 20.2	S34 23.6
Kochab	137 18.7	N74 14.7
Markab	14 05.8	N15 04.9
Menkar	314 43.7	N 3 59.9
Menkent	148 39.6	S36 15.4
Miaplacidus	221 44.4	S69 37.6
Mirfak	309 19.5	N49 47.0
Nunki	76 32.4	S26 19.4
Peacock	54 02.7	S56 48.4
Pollux	244 00.8	N28 04.8
Procyon	245 28.0	N 5 16.8
Rasalhague	96 31.9	N12 34.5
Regulus	208 12.2	N12 04.5
Rigel	281 38.2	S 8 13.9
Rigil Kent.	140 28.8	S60 44.2
Sabik	102 44.0	S15 41.8
Schedar	350 12.1	N56 24.9
Shaula	96 59.2	S37 05.1
Sirius	258 57.6	S16 41.4
Spica	158 59.8	S11 02.6
Suhail	223 12.1	S43 20.6
Vega	80 57.7	N38 45.6
Zuben'ubi	137 35.6	S15 56.8

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	348 17.4	14 51
Mars	49 58.5	10 44
Jupiter	309 03.4	17 26
Saturn	225 08.1	23 00

G.M.T.		SUN G.H.A.	SUN Dec.	MOON G.H.A.	MOON v	MOON Dec.	MOON d	MOON H.P.
d	h	° ′	° ′	° ′	′	° ′	′	′
18	00	176 29.9	S11 44.7	179 46.8	11.3	S 8 18.7	9.9	57.3
	01	191 29.9	43.8	194 17.1	11.3	8 08.8	9.8	57.2
	02	206 30.0	42.9	208 47.4	11.5	7 59.0	9.9	57.2
	03	221 30.0	·· 42.1	223 17.9	11.4	7 49.1	10.0	57.2
	04	236 30.1	41.2	237 48.3	11.5	7 39.1	9.9	57.2
	05	251 30.1	40.3	252 18.8	11.6	7 29.2	10.0	57.1
	06	266 30.2	S11 39.4	266 49.4	11.6	S 7 19.2	10.0	57.1
	07	281 30.2	38.5	281 20.0	11.7	7 09.2	10.1	57.1
	08	296 30.3	37.6	295 50.7	11.7	6 59.1	10.1	57.1
F	09	311 30.4	·· 36.8	310 21.4	11.8	6 49.0	10.1	57.1
R	10	326 30.4	35.9	324 52.2	11.8	6 38.9	10.1	57.0
I	11	341 30.5	35.0	339 23.0	11.8	6 28.8	10.1	57.0
D	12	356 30.5	S11 34.1	353 53.8	11.9	S 6 18.7	10.2	57.0
A	13	11 30.6	33.2	8 24.7	12.0	6 08.5	10.2	57.0
Y	14	26 30.6	32.3	22 55.7	12.0	5 58.3	10.2	56.9
	15	41 30.7	·· 31.5	37 26.7	12.1	5 48.1	10.2	56.9
	16	56 30.7	30.6	51 57.8	12.1	5 37.9	10.3	56.9
	17	71 30.8	29.7	66 28.9	12.1	5 27.6	10.2	56.9
	18	86 30.8	S11 28.8	81 00.0	12.2	S 5 17.4	10.3	56.8
	19	101 30.9	27.9	95 31.2	12.2	5 07.1	10.3	56.8
	20	116 30.9	27.0	110 02.4	12.3	4 56.8	10.3	56.8
	21	131 31.0	·· 26.1	124 33.7	12.3	4 46.5	10.4	56.8
	22	146 31.1	25.2	139 05.0	12.4	4 36.1	10.3	56.7
	23	161 31.1	24.4	153 36.4	12.4	4 25.8	10.4	56.7
19	00	176 31.2	S11 23.5	168 07.8	12.5	S 4 15.4	10.3	56.7
	01	191 31.2	22.6	182 39.3	12.4	4 05.1	10.4	56.7
	02	206 31.3	21.7	197 10.7	12.6	3 54.7	10.4	56.6
	03	221 31.3	·· 20.8	211 42.3	12.6	3 44.3	10.4	56.6
	04	236 31.4	19.9	226 13.9	12.6	3 33.9	10.4	56.6
	05	251 31.5	19.0	240 45.5	12.6	3 23.5	10.4	56.6
	06	266 31.5	S11 18.1	255 17.1	12.7	S 3 13.1	10.4	56.5
	07	281 31.6	17.2	269 48.8	12.7	3 02.7	10.4	56.5
S	08	296 31.6	16.4	284 20.5	12.8	2 52.3	10.4	56.5
A	09	311 31.7	·· 15.5	298 52.3	12.8	2 41.9	10.4	56.5
T	10	326 31.7	14.6	313 24.1	12.9	2 31.5	10.5	56.4
U	11	341 31.8	13.7	327 56.0	12.8	2 21.0	10.4	56.4
R	12	356 31.9	S11 12.8	342 27.8	13.0	S 2 10.6	10.4	56.4
D	13	11 31.9	11.9	356 59.8	12.9	2 00.2	10.4	56.4
A	14	26 32.0	11.0	11 31.7	13.0	1 49.8	10.4	56.3
Y	15	41 32.1	·· 10.1	26 03.7	13.0	1 39.4	10.5	56.3
	16	56 32.1	09.2	40 35.7	13.1	1 28.9	10.4	56.3
	17	71 32.2	08.3	55 07.8	13.0	1 18.5	10.4	56.3
	18	86 32.2	S11 07.4	69 39.8	13.2	S 1 08.1	10.4	56.2
	19	101 32.3	06.5	84 12.0	13.1	0 57.7	10.4	56.2
	20	116 32.4	05.6	98 44.1	13.2	0 47.3	10.4	56.2
	21	131 32.4	·· 04.8	113 16.3	13.2	0 36.9	10.4	56.2
	22	146 32.5	03.9	127 48.5	13.2	0 26.5	10.4	56.1
	23	161 32.5	03.0	142 20.7	13.3	0 16.1	10.3	56.1
20	00	176 32.6	S11 02.1	156 53.0	13.3	S 0 05.8	10.4	56.1
	01	191 32.7	01.2	171 25.3	13.3	N 0 04.6	10.3	56.1
	02	206 32.7	11 00.3	185 57.6	13.4	0 14.9	10.4	56.0
	03	221 32.8	10 59.4	200 30.0	13.3	0 25.3	10.3	56.0
	04	236 32.9	58.5	215 02.3	13.5	0 35.6	10.3	56.0
	05	251 32.9	57.6	229 34.8	13.4	0 45.9	10.3	56.0
	06	266 33.0	S10 56.7	244 07.2	13.4	N 0 56.2	10.3	55.9
	07	281 33.1	55.8	258 39.6	13.5	1 06.5	10.3	55.9
	08	296 33.1	54.9	273 12.1	13.5	1 16.8	10.2	55.9
S	09	311 33.2	·· 54.0	287 44.6	13.6	1 27.0	10.3	55.9
U	10	326 33.3	53.1	302 17.2	13.5	1 37.3	10.2	55.8
N	11	341 33.3	52.2	316 49.7	13.6	1 47.5	10.2	55.8
D	12	356 33.4	S10 51.3	331 22.3	13.6	N 1 57.7	10.2	55.8
A	13	11 33.5	50.4	345 54.9	13.6	2 07.9	10.1	55.8
Y	14	26 33.5	49.5	0 27.5	13.6	2 18.0	10.2	55.7
	15	41 33.6	·· 48.6	15 00.1	13.7	2 28.2	10.1	55.7
	16	56 33.7	47.7	29 32.8	13.7	2 38.3	10.1	55.7
	17	71 33.7	46.8	44 05.5	13.7	2 48.4	10.1	55.7
	18	86 33.8	S10 45.9	58 38.2	13.7	N 2 58.5	10.1	55.6
	19	101 33.9	45.0	73 10.9	13.7	3 08.6	10.0	55.6
	20	116 33.9	44.1	87 43.6	13.8	3 18.6	10.0	55.6
	21	131 34.0	·· 43.2	102 16.4	13.7	3 28.6	10.0	55.6
	22	146 34.1	42.3	116 49.1	13.8	3 38.6	9.9	55.5
	23	161 34.2	41.4	131 21.9	13.8	3 48.5	10.0	55.5
		S.D. 16.2	*d* 0.9	S.D. 15.5		15.4		15.2

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 18	Moonrise 19	Moonrise 20	Moonrise 21
°	h m	h m	h m	h m	h m	h m	h m
N 72	05 58	07 16	08 32	07 47	07 40	07 33	07 26
N 70	05 58	07 09	08 15	07 37	07 36	07 34	07 33
68	05 58	07 02	08 02	07 29	07 32	07 36	07 39
66	05 57	06 57	07 51	07 22	07 30	07 37	07 44
64	05 57	06 52	07 42	07 16	07 27	07 38	07 48
62	05 57	06 48	07 34	07 10	07 25	07 38	07 52
60	05 56	06 44	07 28	07 06	07 23	07 39	07 55
N 58	05 55	06 41	07 22	07 02	07 21	07 40	07 58
56	05 55	06 38	07 16	06 58	07 20	07 40	08 00
54	05 54	06 35	07 12	06 55	07 19	07 41	08 02
52	05 54	06 33	07 07	06 52	07 17	07 41	08 04
50	05 53	06 30	07 04	06 50	07 16	07 41	08 06
45	05 51	06 25	06 55	06 44	07 14	07 42	08 10
N 40	05 49	06 20	06 48	06 39	07 12	07 43	08 14
35	05 47	06 16	06 42	06 35	07 10	07 44	08 17
30	05 44	06 12	06 36	06 31	07 09	07 44	08 20
20	05 39	06 05	06 27	06 25	07 06	07 45	08 24
N 10	05 32	05 57	06 19	06 19	07 03	07 46	08 28
0	05 25	05 49	06 11	06 14	07 01	07 47	08 32
S 10	05 16	05 41	06 02	06 08	06 59	07 48	08 36
20	05 04	05 31	05 54	06 03	06 57	07 49	08 40
30	04 49	05 19	05 43	05 56	06 54	07 50	08 45
35	04 40	05 11	05 38	05 52	06 52	07 51	08 48
40	04 28	05 02	05 31	05 48	06 51	07 52	08 51
45	04 14	04 52	05 23	05 43	06 49	07 53	08 55
S 50	03 55	04 38	05 13	05 37	06 46	07 54	08 59
52	03 46	04 32	05 09	05 34	06 45	07 54	09 01
54	03 36	04 25	05 04	05 31	06 44	07 55	09 04
56	03 24	04 17	04 58	05 28	06 43	07 55	09 06
58	03 09	04 08	04 52	05 24	06 41	07 56	09 09
S 60	02 52	03 58	04 45	05 20	06 39	07 57	09 12

Lat.	Sunset	Twilight Civil	Twilight Naut.	Moonset 18	Moonset 19	Moonset 20	Moonset 21
°	h m	h m	h m	h m	h m	h m	h m
N 72	15 58	17 13	18 32	17 26	19 11	20 52	22 32
N 70	16 14	17 21	18 32	17 34	19 12	20 47	22 21
68	16 27	17 27	18 32	17 40	19 13	20 43	22 11
66	16 38	17 32	18 32	17 46	19 14	20 40	22 04
64	16 47	17 37	18 32	17 51	19 15	20 37	21 57
62	16 55	17 41	18 33	17 55	19 16	20 35	21 52
60	17 01	17 45	18 33	17 58	19 16	20 33	21 47
N 58	17 07	17 48	18 33	18 01	19 17	20 31	21 43
56	17 12	17 51	18 34	18 04	19 18	20 29	21 39
54	17 17	17 53	18 35	18 06	19 18	20 28	21 36
52	17 21	17 56	18 35	18 08	19 18	20 27	21 33
50	17 25	17 58	18 36	18 10	19 19	20 25	21 30
45	17 33	18 03	18 38	18 15	19 20	20 23	21 24
N 40	17 40	18 08	18 40	18 18	19 20	20 20	21 19
35	17 46	18 12	18 42	18 21	19 21	20 19	21 15
30	17 52	18 16	18 44	18 24	19 21	20 17	21 11
20	18 01	18 23	18 49	18 29	19 22	20 14	21 05
N 10	18 09	18 31	18 55	18 33	19 23	20 11	20 59
0	18 17	18 38	19 03	18 37	19 23	20 09	20 54
S 10	18 25	18 47	19 12	18 40	19 24	20 07	20 48
20	18 34	18 56	19 23	18 44	19 25	20 04	20 43
30	18 44	19 09	19 38	18 49	19 26	20 01	20 36
35	18 50	19 16	19 47	18 52	19 26	19 59	20 32
40	18 56	19 25	19 59	18 54	19 26	19 57	20 28
45	19 04	19 35	20 13	18 58	19 27	19 55	20 23
S 50	19 13	19 48	20 31	19 02	19 28	19 52	20 18
52	19 18	19 54	20 40	19 04	19 28	19 51	20 15
54	19 23	20 01	20 50	19 05	19 28	19 50	20 12
56	19 28	20 09	21 02	19 08	19 28	19 48	20 09
58	19 34	20 18	21 16	19 10	19 29	19 47	20 05
S 60	19 41	20 28	21 33	19 13	19 29	19 45	20 01

Day	SUN Eqn. of Time 00ʰ	SUN Eqn. of Time 12ʰ	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
	m s	m s	h m	h m	h m	d	
18	14 01	13 58	12 14	12 25	00 01	00	●
19	13 55	13 53	12 14	13 12	00 49	01	
20	13 50	13 47	12 14	13 58	01 35	02	

G.M.T.		ARIES	VENUS −4.3		MARS +1.5		JUPITER −1.9		SATURN +0.1	
		G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
d	h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
21	00	150 48.0	137 53.3	N 9 34.5	199 11.1	S19 01.8	99 37.9	N17 53.1	16 05.1	N18 08.5
	01	165 50.5	152 54.3	35.5	214 11.6	01.3	114 40.1	53.2	31 07.8	08.5
	02	180 52.9	167 55.3	36.5	229 12.1	00.8	129 42.3	53.2	46 10.4	08.6
	03	195 55.4	182 56.3	· · 37.6	244 12.5	19 00.3	144 44.5	· · 53.3	61 13.1	· · 08.6
	04	210 57.8	197 57.3	38.6	259 13.0	18 59.8	159 46.6	53.4	76 15.7	08.7
	05	226 00.3	212 58.3	39.6	274 13.5	59.3	174 48.8	53.5	91 18.4	08.7
	06	241 02.8	227 59.3	N 9 40.6	289 14.0	S18 58.8	189 51.0	N17 53.6	106 21.0	N18 08.8
	07	256 05.2	243 00.3	41.6	304 14.5	58.3	204 53.2	53.7	121 23.6	08.9
	08	271 07.7	258 01.3	42.6	319 15.0	57.8	219 55.3	53.7	136 26.3	08.9
MONDAY	09	286 10.2	273 02.4	· · 43.6	334 15.4	· · 57.3	234 57.5	· · 53.8	151 28.9	· · 09.0
	10	301 12.6	288 03.4	44.6	349 15.9	56.8	249 59.7	53.9	166 31.6	09.0
	11	316 15.1	303 04.4	45.6	4 16.4	56.3	265 01.9	54.0	181 34.2	09.1
	12	331 17.6	318 05.4	N 9 46.6	19 16.9	S18 55.8	280 04.0	N17 54.1	196 36.9	N18 09.1
	13	346 20.0	333 06.5	47.6	34 17.4	55.3	295 06.2	54.1	211 39.5	09.2
	14	1 22.5	348 07.5	48.6	49 17.9	54.8	310 08.4	54.2	226 42.2	09.2
	15	16 25.0	3 08.5	· · 49.6	64 18.3	· · 54.3	325 10.5	· · 54.3	241 44.8	· · 09.3
	16	31 27.4	18 09.5	50.6	79 18.8	53.8	340 12.7	54.4	256 47.5	09.3
	17	46 29.9	33 10.6	51.6	94 19.3	53.3	355 14.9	54.5	271 50.1	09.4
	18	61 32.3	48 11.6	N 9 52.6	109 19.8	S18 52.8	10 17.1	N17 54.5	286 52.8	N18 09.4
	19	76 34.8	63 12.7	53.6	124 20.3	52.3	25 19.2	54.6	301 55.4	09.5
	20	91 37.3	78 13.7	54.6	139 20.8	51.8	40 21.4	54.7	316 58.1	09.6
	21	106 39.7	93 14.7	· · 55.6	154 21.2	· · 51.3	55 23.6	· · 54.8	332 00.7	· · 09.6
	22	121 42.2	108 15.8	56.6	169 21.7	50.8	70 25.7	54.9	347 03.4	09.7
	23	136 44.7	123 16.8	57.6	184 22.2	50.3	85 27.9	55.0	2 06.0	09.7
22	00	151 47.1	138 17.9	N 9 58.6	199 22.7	S18 49.8	100 30.1	N17 55.0	17 08.7	N18 09.8
	01	166 49.6	153 18.9	9 59.6	214 23.2	49.3	115 32.2	55.1	32 11.3	09.8
	02	181 52.1	168 20.0	10 00.6	229 23.7	48.8	130 34.4	55.2	47 14.0	09.9
	03	196 54.5	183 21.0	· · 01.5	244 24.2	· · 48.3	145 36.6	· · 55.3	62 16.6	· · 09.9
	04	211 57.0	198 22.1	02.5	259 24.6	47.7	160 38.8	55.4	77 19.3	10.0
	05	226 59.5	213 23.1	03.5	274 25.1	47.2	175 40.9	55.5	92 21.9	10.0
	06	242 01.9	228 24.2	N10 04.5	289 25.6	S18 46.7	190 43.1	N17 55.5	107 24.6	N18 10.1
	07	257 04.4	243 25.2	05.5	304 26.1	46.2	205 45.3	55.6	122 27.2	10.1
TUESDAY	08	272 06.8	258 26.3	06.5	319 26.6	45.7	220 47.4	55.7	137 29.9	10.2
	09	287 09.3	273 27.4	· · 07.5	334 27.1	· · 45.2	235 49.6	· · 55.8	152 32.5	· · 10.2
	10	302 11.8	288 28.4	08.5	349 27.6	44.7	250 51.8	55.9	167 35.1	10.3
	11	317 14.2	303 29.5	09.4	4 28.1	44.2	265 53.9	55.9	182 37.8	10.4
	12	332 16.7	318 30.6	N10 10.4	19 28.5	S18 43.7	280 56.1	N17 56.0	197 40.4	N18 10.4
	13	347 19.2	333 31.6	11.4	34 29.0	43.2	295 58.3	56.1	212 43.1	10.5
	14	2 21.6	348 32.7	12.4	49 29.5	42.7	311 00.4	56.2	227 45.7	10.5
	15	17 24.1	3 33.8	· · 13.4	64 30.0	· · 42.2	326 02.6	· · 56.3	242 48.4	· · 10.6
	16	32 26.6	18 34.9	14.4	79 30.5	41.6	341 04.8	56.4	257 51.0	10.6
	17	47 29.0	33 36.0	15.3	94 31.0	41.1	356 06.9	56.4	272 53.7	10.7
	18	62 31.5	48 37.0	N10 16.3	109 31.5	S18 40.6	11 09.1	N17 56.5	287 56.3	N18 10.7
	19	77 34.0	63 38.1	17.3	124 32.0	40.1	26 11.2	56.6	302 59.0	10.8
	20	92 36.4	78 39.2	18.3	139 32.4	39.6	41 13.4	56.7	318 01.6	10.8
	21	107 38.9	93 40.3	· · 19.3	154 32.9	· · 39.1	56 15.6	· · 56.8	333 04.3	· · 10.9
	22	122 41.3	108 41.4	20.2	169 33.4	38.6	71 17.7	56.9	348 06.9	10.9
	23	137 43.8	123 42.5	21.2	184 33.9	38.1	86 19.9	56.9	3 09.6	11.0
23	00	152 46.3	138 43.6	N10 22.2	199 34.4	S18 37.5	101 22.1	N17 57.0	18 12.2	N18 11.0
	01	167 48.7	153 44.7	23.2	214 34.9	37.0	116 24.2	57.1	33 14.8	11.1
	02	182 51.2	168 45.8	24.1	229 35.4	36.5	131 26.4	57.2	48 17.5	11.1
	03	197 53.7	183 46.8	· · 25.1	244 35.9	· · 36.0	146 28.6	· · 57.3	63 20.1	· · 11.2
	04	212 56.1	198 47.9	26.1	259 36.4	35.5	161 30.7	57.4	78 22.8	11.2
	05	227 58.6	213 49.1	27.0	274 36.9	35.0	176 32.9	57.4	93 25.4	11.3
	06	243 01.1	228 50.2	N10 28.0	289 37.3	S18 34.5	191 35.0	N17 57.5	108 28.1	N18 11.4
WEDNESDAY	07	258 03.5	243 51.3	29.0	304 37.8	33.9	206 37.2	57.6	123 30.7	11.4
	08	273 06.0	258 52.4	29.9	319 38.3	33.4	221 39.4	57.7	138 33.4	11.5
	09	288 08.4	273 53.5	· · 30.9	334 38.8	· · 32.9	236 41.5	· · 57.8	153 36.0	· · 11.5
	10	303 10.9	288 54.6	31.9	349 39.3	32.4	251 43.7	57.9	168 38.6	11.6
	11	318 13.4	303 55.7	32.8	4 39.8	31.9	266 45.8	58.0	183 41.3	11.6
	12	333 15.8	318 56.8	N10 33.8	19 40.3	S18 31.4	281 48.0	N17 58.0	198 43.9	N18 11.7
	13	348 18.3	333 57.9	34.8	34 40.8	30.8	296 50.2	58.1	213 46.6	11.7
	14	3 20.8	348 59.1	35.7	49 41.3	30.3	311 52.3	58.2	228 49.2	11.8
	15	18 23.2	4 00.2	· · 36.7	64 41.8	· · 29.8	326 54.5	· · 58.3	243 51.9	· · 11.8
	16	33 25.7	19 01.3	37.7	79 42.3	29.3	341 56.6	58.4	258 54.5	11.9
	17	48 28.2	34 02.4	38.6	94 42.7	28.8	356 58.8	58.5	273 57.2	11.9
	18	63 30.6	49 03.6	N10 39.6	109 43.2	S18 28.2	12 00.9	N17 58.5	288 59.8	N18 12.0
	19	78 33.1	64 04.7	40.5	124 43.7	27.7	27 03.1	58.6	304 02.4	12.0
	20	93 35.6	79 05.8	41.5	139 44.2	27.2	42 05.3	58.7	319 05.1	12.1
	21	108 38.0	94 07.0	· · 42.5	154 44.7	· · 26.7	57 07.4	· · 58.8	334 07.7	· · 12.1
	22	123 40.5	109 08.1	43.4	169 45.2	26.2	72 09.6	58.9	349 10.4	12.2
	23	138 42.9	124 09.2	44.4	184 45.7	25.6	87 11.7	59.0	4 13.0	12.2
Mer. Pass.		h m 13 50.6	v 1.1	d 1.0	v 0.5	d 0.5	v 2.2	d 0.1	v 2.6	d 0.1

STARS		
Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 39.2	S40 24.1
Achernar	335 47.5	S57 21.4
Acrux	173 39.2	S62 58.3
Adhara	255 33.7	S28 56.8
Aldebaran	291 20.7	N16 27.7
Alioth	166 44.2	N56 04.7
Alkaid	153 20.1	N49 25.3
Al Na'ir	28 18.4	S47 04.3
Alnilam	276 14.0	S 1 13.2
Alphard	218 22.6	S 8 33.8
Alphecca	126 34.1	N26 47.3
Alpheratz	358 12.1	N28 57.9
Altair	62 35.1	N 8 48.4
Ankaa	353 43.0	S42 26.0
Antares	112 59.8	S26 22.8
Arcturus	146 20.5	N19 17.9
Atria	108 26.3	S68 58.9
Avior	234 28.6	S59 26.5
Bellatrix	279 01.2	N 6 19.6
Betelgeuse	271 30.7	N 7 24.0
Canopus	264 08.0	S52 41.4
Capella	281 14.7	N45 58.6
Deneb	49 50.5	N45 11.9
Denebola	183 01.2	N14 41.8
Diphda	349 23.5	S18 06.9
Dubhe	194 24.5	N61 52.3
Elnath	278 47.0	N28 35.3
Eltanin	90 59.1	N51 29.3
Enif	34 14.2	N 9 46.2
Fomalhaut	15 54.4	S29 44.7
Gacrux	172 30.8	S56 59.1
Gienah	176 20.1	S17 25.0
Hadar	149 26.3	S60 15.6
Hamal	328 31.8	N23 21.3
Kaus Aust.	84 20.2	S34 23.6
Kochab	137 18.6	N74 14.7
Markab	14 05.8	N15 04.9
Menkar	314 43.7	N 3 59.9
Menkent	148 39.6	S36 15.4
Miaplacidus	221 44.5	S69 37.6
Mirfak	309 19.6	N49 47.0
Nunki	76 32.4	S26 19.4
Peacock	54 02.7	S56 48.4
Pollux	244 00.8	N28 04.8
Procyon	245 28.0	N 5 16.8
Rasalhague	96 31.9	N12 34.5
Regulus	208 12.2	N12 04.5
Rigel	281 38.2	S 8 13.9
Rigil Kent.	140 28.7	S60 44.2
Sabik	102 44.0	S15 41.8
Schedar	350 12.1	N56 24.9
Shaula	96 59.1	S37 05.1
Sirius	258 57.6	S16 41.4
Spica	158 59.8	S11 02.6
Suhail	223 12.1	S43 20.7
Vega	80 57.7	N38 45.6
Zuben'ubi	137 35.6	S15 56.8

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	346 30.7	14 46
Mars	47 35.6	10 42
Jupiter	308 42.9	17 16
Saturn	225 21.5	22 47

G.M.T.	SUN G.H.A.	SUN Dec.	MOON G.H.A.	MOON v	MOON Dec.	MOON d	MOON H.P.
d h	° ′	° ′	° ′	′	° ′	′	′
21 00	176 34.2	S10 40.5	145 54.7	13.8	N 3 58.5	9.9	55.5
01	191 34.3	39.6	160 27.5	13.8	4 08.4	9.9	55.5
02	206 34.4	38.7	175 00.3	13.9	4 18.3	9.8	55.5
03	221 34.4	·· 37.8	189 33.2	13.8	4 28.1	9.8	55.4
04	236 34.5	36.9	204 06.0	13.9	4 37.9	9.8	55.4
05	251 34.6	36.0	218 38.9	13.9	4 47.7	9.8	55.4
06	266 34.7	S10 35.1	233 11.8	13.8	N 4 57.5	9.7	55.4
07	281 34.7	34.2	247 44.6	13.9	5 07.2	9.7	55.3
08	296 34.8	33.3	262 17.5	14.0	5 16.9	9.7	55.3
M 09	311 34.9	·· 32.4	276 50.5	13.9	5 26.6	9.6	55.3
O 10	326 34.9	31.5	291 23.4	13.9	5 36.2	9.6	55.3
N 11	341 35.0	30.6	305 56.3	13.9	5 45.8	9.6	55.3
D 12	356 35.1	S10 29.6	320 29.2	14.0	N 5 55.4	9.5	55.2
A 13	11 35.2	28.7	335 02.2	13.9	6 04.9	9.5	55.2
Y 14	26 35.2	27.8	349 35.1	14.0	6 14.4	9.5	55.2
15	41 35.3	·· 26.9	4 08.1	14.0	6 23.9	9.4	55.2
16	56 35.4	26.0	18 41.1	13.9	6 33.3	9.4	55.2
17	71 35.5	25.1	33 14.0	14.0	6 42.7	9.3	55.1
18	86 35.5	S10 24.2	47 47.0	14.0	N 6 52.0	9.4	55.1
19	101 35.6	23.3	62 20.0	14.0	7 01.4	9.2	55.1
20	116 35.7	22.4	76 53.0	14.0	7 10.6	9.3	55.1
21	131 35.8	·· 21.5	91 26.0	14.0	7 19.9	9.2	55.1
22	146 35.8	20.6	105 59.0	13.9	7 29.1	9.1	55.0
23	161 35.9	19.7	120 31.9	14.0	7 38.2	9.1	55.0
22 00	176 36.0	S10 18.8	135 04.9	14.0	N 7 47.3	9.1	55.0
01	191 36.1	17.8	149 37.9	14.0	7 56.4	9.0	55.0
02	206 36.2	16.9	164 10.9	14.0	8 05.4	9.0	55.0
03	221 36.2	·· 16.0	178 43.9	14.0	8 14.4	9.0	54.9
04	236 36.3	15.1	193 16.9	14.0	8 23.4	8.9	54.9
05	251 36.4	14.2	207 49.9	14.0	8 32.3	8.8	54.9
06	266 36.5	S10 13.3	222 22.9	14.0	N 8 41.1	8.9	54.9
07	281 36.5	12.4	236 55.9	14.0	8 50.0	8.7	54.9
T 08	296 36.6	11.5	251 28.9	14.0	8 58.7	8.7	54.8
U 09	311 36.7	·· 10.6	266 01.9	14.0	9 07.4	8.7	54.8
E 10	326 36.8	09.7	280 34.9	14.0	9 16.1	8.7	54.8
S 11	341 36.9	08.7	295 07.9	14.0	9 24.8	8.5	54.8
D 12	356 36.9	S10 07.8	309 40.9	14.0	N 9 33.3	8.6	54.8
A 13	11 37.0	06.9	324 13.9	14.0	9 41.9	8.5	54.8
Y 14	26 37.1	06.0	338 46.9	13.9	9 50.4	8.4	54.7
15	41 37.2	·· 05.1	353 19.8	14.0	9 58.8	8.4	54.7
16	56 37.3	04.2	7 52.8	13.9	10 07.2	8.3	54.7
17	71 37.4	03.3	22 25.7	14.0	10 15.5	8.3	54.7
18	86 37.4	S10 02.3	36 58.7	13.9	N10 23.8	8.3	54.7
19	101 37.5	01.4	51 31.6	14.0	10 32.1	8.2	54.7
20	116 37.6	10 00.5	66 04.6	13.9	10 40.3	8.1	54.7
21	131 37.7	9 59.6	80 37.5	13.9	10 48.4	8.1	54.6
22	146 37.8	58.7	95 10.4	14.0	10 56.5	8.0	54.6
23	161 37.8	57.8	109 43.4	13.9	11 04.5	8.0	54.6
23 00	176 37.9	S 9 56.9	124 16.3	13.8	N11 12.5	7.9	54.6
01	191 38.0	55.9	138 49.1	13.9	11 20.4	7.9	54.6
02	206 38.1	55.0	153 22.0	13.9	11 28.3	7.8	54.6
03	221 38.2	·· 54.1	167 54.9	13.9	11 36.1	7.8	54.6
04	236 38.3	53.2	182 27.8	13.8	11 43.9	7.7	54.5
05	251 38.4	52.3	197 00.6	13.9	11 51.6	7.7	54.5
06	266 38.4	S 9 51.4	211 33.5	13.8	N11 59.3	7.6	54.5
W 07	281 38.5	50.4	226 06.3	13.8	12 06.9	7.5	54.5
E 08	296 38.6	49.5	240 39.1	13.8	12 14.4	7.5	54.5
D 09	311 38.7	·· 48.6	255 11.9	13.8	12 21.9	7.4	54.5
N 10	326 38.8	47.7	269 44.7	13.8	12 29.3	7.4	54.5
E 11	341 38.9	46.8	284 17.5	13.7	12 36.7	7.3	54.5
S 12	356 39.0	S 9 45.9	298 50.2	13.8	N12 44.0	7.2	54.4
D 13	11 39.0	44.9	313 23.0	13.7	12 51.2	7.2	54.4
A 14	26 39.1	44.0	327 55.7	13.8	12 58.4	7.2	54.4
Y 15	41 39.2	·· 43.1	342 28.5	13.7	13 05.6	7.0	54.4
16	56 39.3	42.2	357 01.2	13.6	13 12.6	7.0	54.4
17	71 39.4	41.3	11 33.8	13.7	13 19.6	7.0	54.4
18	86 39.5	S 9 40.3	26 06.5	13.7	N13 26.6	6.9	54.4
19	101 39.6	39.4	40 39.2	13.6	13 33.5	6.8	54.4
20	116 39.7	38.5	55 11.8	13.6	13 40.3	6.8	54.4
21	131 39.8	·· 37.6	69 44.4	13.6	13 47.1	6.7	54.4
22	146 39.8	36.7	84 17.0	13.6	13 53.8	6.6	54.3
23	161 39.9	35.7	98 49.6	13.6	14 00.4	6.6	54.3
	S.D. 16.2	*d* 0.9	S.D. 15.1		14.9		14.8

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 21	Moonrise 22	Moonrise 23	Moonrise 24
°	h m	h m	h m	h m	h m	h m	h m
N 72	05 44	07 02	08 15	07 26	07 19	07 12	07 03
N 70	05 46	06 56	08 01	07 33	07 32	07 32	07 34
68	05 47	06 51	07 49	07 39	07 43	07 49	07 57
66	05 47	06 47	07 40	07 44	07 52	08 02	08 15
64	05 48	06 43	07 32	07 48	07 59	08 13	08 30
62	05 48	06 39	07 25	07 52	08 06	08 22	08 42
60	05 48	06 36	07 19	07 55	08 12	08 30	08 53
N 58	05 48	06 34	07 14	07 58	08 16	08 37	09 02
56	05 48	06 31	07 09	08 00	08 21	08 44	09 10
54	05 48	06 29	07 05	08 02	08 25	08 49	09 17
52	05 48	06 27	07 01	08 04	08 29	08 55	09 24
50	05 47	06 25	06 58	08 06	08 32	08 59	09 30
45	05 46	06 20	06 50	08 10	08 39	09 09	09 42
N 40	05 45	06 16	06 44	08 14	08 45	09 18	09 53
35	05 43	06 13	06 38	08 17	08 50	09 25	10 02
30	05 41	06 09	06 34	08 20	08 55	09 31	10 10
20	05 37	06 03	06 25	08 24	09 03	09 42	10 23
N 10	05 31	05 56	06 17	08 28	09 10	09 52	10 35
0	05 25	05 49	06 10	08 32	09 17	10 01	10 47
S 10	05 17	05 41	06 03	08 36	09 24	10 11	10 58
20	05 06	05 32	05 55	08 40	09 31	10 21	11 10
30	04 52	05 21	05 46	08 45	09 39	10 32	11 24
35	04 43	05 14	05 40	08 48	09 44	10 39	11 32
40	04 32	05 06	05 34	08 51	09 49	10 46	11 42
45	04 19	04 56	05 27	08 55	09 56	10 55	11 53
S 50	04 02	04 44	05 18	08 59	10 03	11 06	12 06
52	03 53	04 38	05 14	09 01	10 07	11 10	12 12
54	03 44	04 32	05 10	09 04	10 11	11 16	12 19
56	03 33	04 25	05 05	09 06	10 15	11 22	12 26
58	03 20	04 16	05 00	09 09	10 20	11 29	12 35
S 60	03 04	04 07	04 53	09 12	10 25	11 37	12 45

Lat.	Sunset	Twilight Civil	Twilight Naut.	Moonset 21	Moonset 22	Moonset 23	Moonset 24
°	h m	h m	h m	h m	h m	h m	h m
N 72	16 14	17 27	18 45	22 32	24 12	00 12	01 55
N 70	16 28	17 33	18 44	22 21	23 53	25 25	01 25
68	16 39	17 38	18 42	22 11	23 38	25 03	01 03
66	16 49	17 42	18 42	22 04	23 26	24 45	00 45
64	16 56	17 46	18 41	21 57	23 16	24 31	00 31
62	17 03	17 49	18 40	21 52	23 07	24 19	00 19
60	17 09	17 52	18 40	21 47	23 00	24 09	00 09
N 58	17 14	17 54	18 40	21 43	22 53	24 01	00 01
56	17 19	17 57	18 40	21 39	22 47	23 53	24 56
54	17 23	17 59	18 40	21 36	22 42	23 46	24 48
52	17 27	18 01	18 40	21 33	22 38	23 40	24 40
50	17 30	18 03	18 41	21 30	22 33	23 35	24 34
45	17 38	18 07	18 41	21 24	22 24	23 23	24 19
N 40	17 44	18 11	18 43	21 19	22 17	23 13	24 08
35	17 49	18 15	18 44	21 15	22 10	23 05	23 58
30	17 54	18 18	18 46	21 11	22 05	22 57	23 49
20	18 02	18 25	18 50	21 05	21 55	22 45	23 34
N 10	18 10	18 31	18 56	20 59	21 46	22 34	23 21
0	18 17	18 38	19 02	20 54	21 38	22 23	23 09
S 10	18 24	18 45	19 10	20 48	21 30	22 13	22 57
20	18 32	18 54	19 21	20 43	21 22	22 02	22 44
30	18 41	19 05	19 34	20 36	21 12	21 49	22 29
35	18 46	19 12	19 43	20 32	21 06	21 42	22 20
40	18 52	19 20	19 54	20 28	21 00	21 34	22 10
45	18 59	19 30	20 07	20 23	20 53	21 24	21 59
S 50	19 08	19 42	20 24	20 18	20 44	21 13	21 45
52	19 11	19 47	20 32	20 15	20 40	21 07	21 38
54	19 16	19 54	20 41	20 12	20 35	21 01	21 31
56	19 21	20 01	20 52	20 09	20 31	20 55	21 23
58	19 26	20 09	21 05	20 05	20 25	20 48	21 14
S 60	19 32	20 18	21 20	20 01	20 19	20 39	21 04

Day	SUN Eqn. of Time 00ʰ	SUN Eqn. of Time 12ʰ	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	Age	Phase
	m s	m s	h m	h m	h m	d	
21	13 43	13 40	12 14	14 43	02 21	03	
22	13 36	13 32	12 14	15 28	03 05	04	●
23	13 28	13 24	12 13	16 12	03 50	05	

1977 FEBRUARY 24, 25, 26 (THURS., FRI., SAT.)

G.M.T.	ARIES	VENUS −4.3		MARS +1.5		JUPITER −1.9		SATURN +0.1		STARS		
	G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	Name	S.H.A.	Dec.
d h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	° ′
24 00	153 45.4	139 10.4	N10 45.3	199 46.2	S18 25.1	102 13.9	N17 59.1	19 15.7	N18 12.3	Acamar	315 39.2	S40 24.1
01	168 47.9	154 11.5	46.3	214 46.7	24.6	117 16.0	59.1	34 18.3	12.3	Achernar	335 47.5	S57 21.4
02	183 50.3	169 12.7	47.2	229 47.2	24.1	132 18.2	59.2	49 21.0	12.4	Acrux	173 39.2	S62 58.3
03	198 52.8	184 13.8	·· 48.2	244 47.7	·· 23.6	147 20.4	·· 59.3	64 23.6	·· 12.4	Adhara	255 33.7	S28 56.8
04	213 55.3	199 15.0	49.1	259 48.2	23.0	162 22.5	59.4	79 26.2	12.5	Aldebaran	291 20.7	N16 27.7
05	228 57.7	214 16.1	50.1	274 48.7	22.5	177 24.7	59.5	94 28.9	12.5			
06	244 00.2	229 17.3	N10 51.0	289 49.2	S18 22.0	192 26.8	N17 59.6	109 31.5	N18 12.6	Alioth	166 44.2	N56 04.8
07	259 02.7	244 18.4	52.0	304 49.7	21.5	207 29.0	59.6	124 34.2	12.7	Alkaid	153 20.1	N49 25.4
T 08	274 05.1	259 19.6	52.9	319 50.1	20.9	222 31.1	59.7	139 36.8	12.7	Al Na'ir	28 18.4	S47 04.3
H 09	289 07.6	274 20.7	·· 53.9	334 50.6	·· 20.4	237 33.3	·· 59.8	154 39.5	·· 12.8	Alnilam	276 14.0	S 1 13.2
U 10	304 10.1	289 21.9	54.8	349 51.1	19.9	252 35.4	17 59.9	169 42.1	12.8	Alphard	218 22.6	S 8 33.8
R 11	319 12.5	304 23.1	55.8	4 51.6	19.4	267 37.6	18 00.0	184 44.7	12.9			
S 12	334 15.0	319 24.2	N10 56.7	19 52.1	S18 18.8	282 39.7	N18 00.1	199 47.4	N18 12.9	Alphecca	126 34.1	N26 47.3
D 13	349 17.4	334 25.4	57.7	34 52.6	18.3	297 41.9	00.2	214 50.0	13.0	Alpheratz	358 12.1	N28 57.9
A 14	4 19.9	349 26.6	58.6	49 53.1	17.8	312 44.0	00.2	229 52.7	13.0	Altair	62 35.1	N 8 48.4
Y 15	19 22.4	4 27.7	10 59.5	64 53.6	·· 17.3	327 46.2	·· 00.3	244 55.3	·· 13.1	Ankaa	353 43.0	S42 26.0
16	34 24.8	19 28.9	11 00.5	79 54.1	16.7	342 48.3	00.4	259 57.9	13.1	Antares	112 59.8	S26 22.8
17	49 27.3	34 30.1	01.4	94 54.6	16.2	357 50.5	00.5	275 00.6	13.2			
18	64 29.8	49 31.3	N11 02.4	109 55.1	S18 15.7	12 52.7	N18 00.6	290 03.2	N18 13.2	Arcturus	146 20.5	N19 17.9
19	79 32.2	64 32.4	03.3	124 55.6	15.2	27 54.8	00.7	305 05.9	13.3	Atria	108 26.2	S68 58.9
20	94 34.7	79 33.6	04.2	139 56.1	14.6	42 57.0	00.8	320 08.5	13.3	Avior	234 28.6	S59 26.5
21	109 37.2	94 34.8	·· 05.2	154 56.6	·· 14.1	57 59.1	·· 00.8	335 11.2	·· 13.4	Bellatrix	279 01.2	N 6 19.6
22	124 39.6	109 36.0	06.1	169 57.1	13.6	73 01.3	00.9	350 13.8	13.4	Betelgeuse	271 30.7	N 7 24.0
23	139 42.1	124 37.2	07.0	184 57.6	13.0	88 03.4	01.0	5 16.4	13.5			
25 00	154 44.5	139 38.4	N11 08.0	199 58.1	S18 12.5	103 05.6	N18 01.1	20 19.1	N18 13.5	Canopus	264 08.0	S52 41.4
01	169 47.0	154 39.6	08.9	214 58.6	12.0	118 07.7	01.2	35 21.7	13.6	Capella	281 14.7	N45 58.6
02	184 49.5	169 40.8	09.8	229 59.1	11.4	133 09.9	01.3	50 24.4	13.6	Deneb	49 50.5	N45 11.8
03	199 51.9	184 42.0	·· 10.8	244 59.6	·· 10.9	148 12.0	·· 01.4	65 27.0	·· 13.7	Denebola	183 01.2	N14 41.8
04	214 54.4	199 43.2	11.7	260 00.1	10.4	163 14.2	01.4	80 29.6	13.7	Diphda	349 23.5	S18 06.9
05	229 56.9	214 44.4	12.6	275 00.6	09.9	178 16.3	01.5	95 32.3	13.8			
06	244 59.3	229 45.6	N11 13.6	290 01.1	S18 09.3	193 18.4	N18 01.6	110 34.9	N18 13.8	Dubhe	194 24.5	N61 52.3
07	260 01.8	244 46.8	14.5	305 01.6	08.8	208 20.6	01.7	125 37.6	13.9	Elnath	278 47.0	N28 35.3
08	275 04.3	259 48.0	15.4	320 02.1	08.3	223 22.7	01.8	140 40.2	13.9	Eltanin	90 59.0	N51 29.3
F 09	290 06.7	274 49.2	·· 16.4	335 02.6	·· 07.7	238 24.9	·· 01.9	155 42.8	·· 14.0	Enif	34 14.2	N 9 46.2
R 10	305 09.2	289 50.4	17.3	350 03.1	07.2	253 27.0	02.0	170 45.5	14.0	Fomalhaut	15 54.4	S29 44.7
I 11	320 11.7	304 51.6	18.2	5 03.6	06.7	268 29.2	02.1	185 48.1	14.1			
D 12	335 14.1	319 52.8	N11 19.1	20 04.1	S18 06.1	283 31.3	N18 02.1	200 50.8	N18 14.1	Gacrux	172 30.8	S56 59.1
A 13	350 16.6	334 54.0	20.0	35 04.6	05.6	298 33.5	02.2	215 53.4	14.2	Gienah	176 20.1	S17 25.0
Y 14	5 19.0	349 55.3	21.0	50 05.1	05.1	313 35.6	02.3	230 56.0	14.2	Hadar	149 26.3	S60 15.6
15	20 21.5	4 56.5	·· 21.9	65 05.6	·· 04.5	328 37.8	·· 02.4	245 58.7	·· 14.3	Hamal	328 31.8	N23 21.3
16	35 24.0	19 57.7	22.8	80 06.1	04.0	343 39.9	02.5	261 01.3	14.3	Kaus Aust.	84 20.2	S34 23.6
17	50 26.4	34 58.9	23.7	95 06.6	03.5	358 42.1	02.6	276 04.0	14.4			
18	65 28.9	50 00.2	N11 24.6	110 07.1	S18 02.9	13 44.2	N18 02.7	291 06.6	N18 14.4	Kochab	137 18.6	N74 14.7
19	80 31.4	65 01.4	25.6	125 07.6	02.4	28 46.3	02.7	306 09.2	14.5	Markab	14 05.8	N15 04.9
20	95 33.8	80 02.6	26.5	140 08.1	01.8	43 48.5	02.8	321 11.9	14.5	Menkar	314 43.7	N 3 59.9
21	110 36.3	95 03.9	·· 27.4	155 08.6	·· 01.3	58 50.6	·· 02.9	336 14.5	·· 14.6	Menkent	148 39.6	S36 15.4
22	125 38.8	110 05.1	28.3	170 09.1	00.8	73 52.8	03.0	351 17.2	14.6	Miaplacidus	221 44.5	S69 37.6
23	140 41.2	125 06.4	29.2	185 09.6	18 00.2	88 54.9	03.1	6 19.8	14.7			
26 00	155 43.7	140 07.6	N11 30.1	200 10.1	S17 59.7	103 57.1	N18 03.2	21 22.4	N18 14.7	Mirfak	309 19.6	N49 47.0
01	170 46.2	155 08.8	31.0	215 10.6	59.2	118 59.2	03.3	36 25.1	14.8	Nunki	76 32.3	S26 19.4
02	185 48.6	170 10.1	32.0	230 11.1	58.6	134 01.4	03.4	51 27.7	14.8	Peacock	54 02.7	S56 48.4
03	200 51.1	185 11.3	·· 32.9	245 11.6	·· 58.1	149 03.5	·· 03.4	66 30.3	·· 14.9	Pollux	244 00.8	N28 04.8
04	215 53.5	200 12.6	33.8	260 12.1	57.5	164 05.6	03.5	81 33.0	14.9	Procyon	245 28.0	N 5 16.8
05	230 56.0	215 13.8	34.7	275 12.6	57.0	179 07.8	03.6	96 35.6	15.0			
06	245 58.5	230 15.1	N11 35.6	290 13.1	S17 56.5	194 09.9	N18 03.7	111 38.3	N18 15.0	Rasalhague	96 31.9	N12 34.5
07	261 00.9	245 16.4	36.5	305 13.6	55.9	209 12.1	03.8	126 40.9	15.1	Regulus	208 12.2	N12 04.5
S 08	276 03.4	260 17.6	37.4	320 14.1	55.4	224 14.2	03.9	141 43.5	15.1	Rigel	281 38.2	S 8 13.9
A 09	291 05.9	275 18.9	·· 38.3	335 14.6	·· 54.8	239 16.3	·· 04.0	156 46.2	·· 15.2	Rigil Kent.	140 28.7	S60 44.2
T 10	306 08.3	290 20.1	39.2	350 15.1	54.3	254 18.5	04.1	171 48.8	15.2	Sabik	102 43.9	S15 41.8
U 11	321 10.8	305 21.4	40.1	5 15.6	53.8	269 20.6	04.1	186 51.4	15.3			
R 12	336 13.3	320 22.7	N11 41.0	20 16.1	S17 53.2	284 22.8	N18 04.2	201 54.1	N18 15.3	Schedar	350 12.1	N56 24.9
D 13	351 15.7	335 24.0	41.9	35 16.6	52.7	299 24.9	04.3	216 56.7	15.4	Shaula	96 59.1	S37 05.1
A 14	6 18.2	350 25.2	42.8	50 17.1	52.1	314 27.0	04.4	231 59.4	15.4	Sirius	258 57.6	S16 41.4
Y 15	21 20.6	5 26.5	·· 43.7	65 17.6	·· 51.6	329 29.2	·· 04.5	247 02.0	·· 15.5	Spica	158 59.8	S11 02.6
16	36 23.1	20 27.8	44.6	80 18.1	51.1	344 31.3	04.6	262 04.6	15.5	Suhail	223 12.1	S43 20.7
17	51 25.6	35 29.1	45.5	95 18.6	50.5	359 33.5	04.7	277 07.3	15.6			
18	66 28.0	50 30.3	N11 46.4	110 19.1	S17 50.0	14 35.6	N18 04.8	292 09.9	N18 15.6	Vega	80 57.7	N38 45.6
19	81 30.5	65 31.6	47.3	125 19.6	49.4	29 37.7	04.9	307 12.5	15.7	Zuben'ubi	137 35.5	S15 56.9
20	96 33.0	80 32.9	48.2	140 20.1	48.9	44 39.9	04.9	322 15.2	15.7			
21	111 35.4	95 34.2	·· 49.1	155 20.6	·· 48.3	59 42.0	·· 05.0	337 17.8	·· 15.8			
22	126 37.9	110 35.5	50.0	170 21.1	47.8	74 44.1	05.1	352 20.5	15.8			
23	141 40.4	125 36.8	50.9	185 21.6	47.2	89 46.3	05.2	7 23.1	15.9			
Mer. Pass.	h m 13 38.8	v 1.2	d 0.9	v 0.5	d 0.5	v 2.1	d 0.1	v 2.6	d 0.1			

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	344 53.8	14 40
Mars	45 13.5	10 40
Jupiter	308 21.0	17 05
Saturn	225 34.5	22 35

	G.M.T.	SUN G.H.A.	SUN Dec.	MOON G.H.A.	MOON *v*	MOON Dec.	MOON *d*	MOON H.P.
	d h	° ′	° ′	° ′	′	° ′	′	′
	24 00	176 40.0	S 9 34.8	113 22.2	13.6	N14 07.0	6.5	54.3
	01	191 40.1	33.9	127 54.8	13.5	14 13.5	6.4	54.3
	02	206 40.2	33.0	142 27.3	13.5	14 19.9	6.4	54.3
	03	221 40.3	·· 32.0	156 59.8	13.5	14 26.3	6.3	54.3
	04	236 40.4	31.1	171 32.3	13.5	14 32.6	6.3	54.3
	05	251 40.5	30.2	186 04.8	13.4	14 38.9	6.2	54.3
	06	266 40.6	S 9 29.3	200 37.2	13.5	N14 45.1	6.1	54.3
	07	281 40.7	28.4	215 09.7	13.4	14 51.2	6.0	54.3
T	08	296 40.8	27.4	229 42.1	13.4	14 57.2	6.0	54.3
H	09	311 40.8	·· 26.5	244 14.5	13.4	15 03.2	5.9	54.3
U	10	326 40.9	25.6	258 46.9	13.3	15 09.1	5.9	54.3
R	11	341 41.0	24.7	273 19.2	13.4	15 15.0	5.8	54.3
S	12	356 41.1	S 9 23.7	287 51.6	13.3	N15 20.8	5.7	54.3
D	13	11 41.2	22.8	302 23.9	13.3	15 26.5	5.6	54.3
A	14	26 41.3	21.9	316 56.2	13.2	15 32.1	5.6	54.3
Y	15	41 41.4	·· 21.0	331 28.4	13.3	15 37.7	5.5	54.2
	16	56 41.5	20.0	346 00.7	13.2	15 43.2	5.4	54.2
	17	71 41.6	19.1	0 32.9	13.2	15 48.6	5.4	54.2
	18	86 41.7	S 9 18.2	15 05.1	13.2	N15 54.0	5.3	54.2
	19	101 41.8	17.3	29 37.3	13.2	15 59.3	5.2	54.2
	20	116 41.9	16.3	44 09.5	13.1	16 04.5	5.2	54.2
	21	131 42.0	·· 15.4	58 41.6	13.1	16 09.7	5.0	54.2
	22	146 42.1	14.5	73 13.7	13.1	16 14.7	5.0	54.2
	23	161 42.2	13.5	87 45.8	13.1	16 19.7	5.0	54.2
	25 00	176 42.3	S 9 12.6	102 17.9	13.0	N16 24.7	4.8	54.2
	01	191 42.4	11.7	116 49.9	13.0	16 29.5	4.8	54.2
	02	206 42.5	10.8	131 21.9	13.0	16 34.3	4.7	54.2
	03	221 42.6	·· 09.8	145 53.9	13.0	16 39.0	4.6	54.2
	04	236 42.7	08.9	160 25.9	12.9	16 43.6	4.6	54.2
	05	251 42.8	08.0	174 57.8	13.0	16 48.2	4.5	54.2
	06	266 42.9	S 9 07.1	189 29.8	12.9	N16 52.7	4.4	54.2
	07	281 43.0	06.1	204 01.7	12.8	16 57.1	4.3	54.2
	08	296 43.1	05.2	218 33.5	12.9	17 01.4	4.3	54.2
F	09	311 43.1	·· 04.3	233 05.4	12.8	17 05.7	4.2	54.2
R	10	326 43.2	03.3	247 37.2	12.8	17 09.9	4.1	54.2
I	11	341 43.3	02.4	262 09.0	12.8	17 14.0	4.0	54.2
D	12	356 43.4	S 9 01.5	276 40.8	12.8	N17 18.0	4.0	54.2
A	13	11 43.5	9 00.5	291 12.6	12.7	17 22.0	3.8	54.2
Y	14	26 43.6	8 59.6	305 44.3	12.7	17 25.8	3.8	54.2
	15	41 43.7	·· 58.7	320 16.0	12.7	17 29.6	3.7	54.3
	16	56 43.8	57.8	334 47.7	12.6	17 33.3	3.7	54.3
	17	71 43.9	56.8	349 19.3	12.6	17 37.0	3.5	54.3
	18	86 44.1	S 8 55.9	3 50.9	12.6	N17 40.5	3.5	54.3
	19	101 44.2	55.0	18 22.5	12.6	17 44.0	3.4	54.3
	20	116 44.3	54.0	32 54.1	12.6	17 47.4	3.3	54.3
	21	131 44.4	·· 53.1	47 25.7	12.5	17 50.7	3.3	54.3
	22	146 44.5	52.2	61 57.2	12.5	17 54.0	3.1	54.3
	23	161 44.6	51.2	76 28.7	12.5	17 57.1	3.1	54.3
	26 00	176 44.7	S 8 50.3	91 00.2	12.4	N18 00.2	3.0	54.3
	01	191 44.8	49.4	105 31.6	12.5	18 03.2	2.9	54.3
	02	206 44.9	48.4	120 03.1	12.4	18 06.1	2.8	54.3
	03	221 45.0	·· 47.5	134 34.5	12.3	18 08.9	2.8	54.3
	04	236 45.1	46.6	149 05.8	12.4	18 11.7	2.6	54.3
	05	251 45.2	45.6	163 37.2	12.3	18 14.3	2.6	54.3
	06	266 45.3	S 8 44.7	178 08.5	12.3	N18 16.9	2.5	54.3
	07	281 45.4	43.8	192 39.8	12.3	18 19.4	2.4	54.3
S	08	296 45.5	42.8	207 11.1	12.3	18 21.8	2.4	54.4
A	09	311 45.6	·· 41.9	221 42.4	12.2	18 24.2	2.2	54.4
T	10	326 45.7	41.0	236 13.6	12.2	18 26.4	2.2	54.4
U	11	341 45.8	40.0	250 44.8	12.2	18 28.6	2.0	54.4
R	12	356 45.9	S 8 39.1	265 16.0	12.1	N18 30.6	2.0	54.4
D	13	11 46.0	38.1	279 47.1	12.2	18 32.6	1.9	54.4
A	14	26 46.1	37.2	294 18.3	12.1	18 34.5	1.9	54.4
Y	15	41 46.2	·· 36.3	308 49.4	12.0	18 36.4	1.7	54.4
	16	56 46.3	35.3	323 20.4	12.1	18 38.1	1.6	54.4
	17	71 46.4	34.4	337 51.5	12.0	18 39.7	1.6	54.5
	18	86 46.6	S 8 33.5	352 22.5	12.0	N18 41.3	1.5	54.5
	19	101 46.7	32.5	6 53.5	12.0	18 42.8	1.4	54.5
	20	116 46.8	31.6	21 24.5	12.0	18 44.2	1.3	54.5
	21	131 46.9	·· 30.6	35 55.5	11.9	18 45.5	1.2	54.5
	22	146 47.0	29.7	50 26.4	11.9	18 46.7	1.1	54.5
	23	161 47.1	28.8	64 57.3	11.9	18 47.8	1.1	54.5
		S.D. 16.2	*d* 0.9	S.D.	14.8		14.8	14.8

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 24	Moonrise 25	Moonrise 26	Moonrise 27
°	h m	h m	h m	h m	h m	h m	h m
N 72	05 30	06 48	07 59	07 03	06 49	☐	☐
N 70	05 33	06 43	07 47	07 34	07 39	07 51	08 21
68	05 35	06 39	07 37	07 57	08 10	08 33	09 10
66	05 37	06 36	07 29	08 15	08 34	09 01	09 41
64	05 38	06 33	07 22	08 30	08 52	09 23	10 05
62	05 39	06 31	07 16	08 42	09 07	09 40	10 23
60	05 40	06 28	07 11	08 53	09 20	09 55	10 38
N 58	05 41	06 26	07 06	09 02	09 31	10 07	10 51
56	05 41	06 24	07 02	09 10	09 41	10 18	11 02
54	05 42	06 22	06 58	09 17	09 49	10 27	11 12
52	05 42	06 21	06 55	09 24	09 57	10 36	11 21
50	05 42	06 19	06 52	09 30	10 04	10 43	11 29
45	05 42	06 16	06 45	09 42	10 19	11 00	11 46
N 40	05 41	06 12	06 40	09 53	10 31	11 13	11 59
35	05 40	06 09	06 35	10 02	10 41	11 24	12 11
30	05 39	06 06	06 30	10 10	10 50	11 34	12 21
20	05 35	06 01	06 23	10 23	11 06	11 51	12 39
N 10	05 30	05 55	06 16	10 35	11 20	12 06	12 54
0	05 25	05 49	06 10	10 47	11 33	12 20	13 08
S 10	05 17	05 42	06 03	10 58	11 46	12 34	13 22
20	05 07	05 34	05 56	11 10	12 00	12 49	13 38
30	04 55	05 23	05 48	11 24	12 16	13 06	13 55
35	04 46	05 17	05 43	11 32	12 25	13 16	14 06
40	04 36	05 10	05 38	11 42	12 36	13 28	14 17
45	04 24	05 01	05 31	11 53	12 48	13 41	14 31
S 50	04 08	04 50	05 24	12 06	13 03	13 58	14 48
52	04 00	04 44	05 20	12 12	13 11	14 06	14 56
54	03 51	04 38	05 16	12 19	13 19	14 14	15 05
56	03 41	04 32	05 12	12 26	13 28	14 24	15 15
58	03 29	04 24	05 07	12 35	13 38	14 35	15 26
S 60	03 15	04 16	05 01	12 45	13 49	14 48	15 39

Lat.	Sunset	Twilight Civil	Twilight Naut.	Moonset 24	Moonset 25	Moonset 26	Moonset 27
°	h m	h m	h m	h m	h m	h m	h m
N 72	16 29	17 41	18 59	01 55	03 45	☐	☐
N 70	16 41	17 45	18 56	01 25	02 55	04 20	05 29
68	16 51	17 49	18 53	01 03	02 24	03 39	04 40
66	16 59	17 52	18 51	00 45	02 01	03 10	04 09
64	17 06	17 55	18 50	00 31	01 43	02 49	03 46
62	17 12	17 57	18 48	00 19	01 28	02 32	03 28
60	17 17	17 59	18 47	00 09	01 16	02 17	03 12
N 58	17 21	18 01	18 47	00 01	01 05	02 05	03 00
56	17 25	18 03	18 46	24 56	00 56	01 55	02 48
54	17 29	18 05	18 46	24 48	00 48	01 45	02 39
52	17 32	18 06	18 45	24 40	00 40	01 37	02 30
50	17 35	18 08	18 45	24 34	00 34	01 30	02 22
45	17 42	18 11	18 45	24 19	00 19	01 14	02 05
N 40	17 47	18 15	18 46	24 08	00 08	01 01	01 52
35	17 52	18 17	18 47	23 58	24 50	00 50	01 40
30	17 56	18 20	18 48	23 49	24 40	00 40	01 30
20	18 04	18 26	18 51	23 34	24 24	00 24	01 13
N 10	18 10	18 31	18 56	23 21	24 09	00 09	00 57
0	18 16	18 37	19 02	23 09	23 55	24 43	00 43
S 10	18 23	18 44	19 09	22 57	23 42	24 29	00 29
20	18 30	18 52	19 18	22 44	23 27	24 14	00 14
30	18 38	19 02	19 31	22 29	23 11	23 56	24 45
35	18 42	19 08	19 39	22 20	23 01	23 46	24 35
40	18 48	19 16	19 49	22 10	22 50	23 34	24 23
45	18 54	19 24	20 01	21 59	22 37	23 21	24 09
S 50	19 02	19 35	20 17	21 45	22 22	23 04	23 53
52	19 05	19 41	20 24	21 38	22 14	22 56	23 45
54	19 09	19 46	20 33	21 31	22 06	22 47	23 36
56	19 13	19 53	20 43	21 23	21 57	22 37	23 26
58	19 18	20 00	20 54	21 14	21 47	22 26	23 15
S 60	19 23	20 09	21 08	21 04	21 35	22 13	23 02

Day	SUN Eqn. of Time 00ʰ	SUN Eqn. of Time 12ʰ	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
	m s	m s	h m	h m	h m	d	
24	13 20	13 16	12 13	16 58	04 35	06	◐
25	13 11	13 06	12 13	17 44	05 21	07	
26	13 02	12 57	12 13	18 32	06 08	08	

1977 FEB. 27, 28, MAR. 1 (SUN., MON., TUES.)

G.M.T.		ARIES	VENUS −4.3		MARS +1.4		JUPITER −1.8		SATURN +0.2	
		G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
d	h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
27	00	156 42.8	140 38.1	N11 51.8	200 22.2	S17 46.7	104 48.4	N18 05.3	22 25.7	N18 15.9
	01	171 45.3	155 39.4	52.6	215 22.7	46.2	119 50.6	05.4	37 28.4	16.0
	02	186 47.8	170 40.7	53.5	230 23.2	45.6	134 52.7	05.5	52 31.0	16.0
	03	201 50.2	185 42.0	·· 54.4	245 23.7	·· 45.1	149 54.8	·· 05.6	67 33.6	·· 16.1
	04	216 52.7	200 43.3	55.3	260 24.2	44.5	164 57.0	05.6	82 36.3	16.1
	05	231 55.1	215 44.6	56.2	275 24.7	44.0	179 59.1	05.7	97 38.9	16.2
	06	246 57.6	230 45.9	N11 57.1	290 25.2	S17 43.4	195 01.2	N18 05.8	112 41.5	N18 16.2
	07	262 00.1	245 47.2	58.0	305 25.7	42.9	210 03.4	05.9	127 44.2	16.3
	08	277 02.5	260 48.6	58.8	320 26.2	42.3	225 05.5	06.0	142 46.8	16.3
S	09	292 05.0	275 49.9	11 59.7	335 26.7	·· 41.8	240 07.6	·· 06.1	157 49.4	·· 16.4
U	10	307 07.5	290 51.2	12 00.6	350 27.2	41.2	255 09.8	06.2	172 52.1	16.4
N	11	322 09.9	305 52.5	01.5	5 27.7	40.7	270 11.9	06.3	187 54.7	16.5
D	12	337 12.4	320 53.8	N12 02.4	20 28.2	S17 40.1	285 14.0	N18 06.4	202 57.3	N18 16.5
A	13	352 14.9	335 55.2	03.2	35 28.7	39.6	300 16.2	06.4	218 00.0	16.6
Y	14	7 17.3	350 56.5	04.1	50 29.2	39.0	315 18.3	06.5	233 02.6	16.6
	15	22 19.8	5 57.8	·· 05.0	65 29.8	·· 38.5	330 20.4	·· 06.6	248 05.3	·· 16.7
	16	37 22.3	20 59.2	05.9	80 30.3	37.9	345 22.6	06.7	263 07.9	16.7
	17	52 24.7	36 00.5	06.7	95 30.8	37.4	0 24.7	06.8	278 10.5	16.8
	18	67 27.2	51 01.8	N12 07.6	110 31.3	S17 36.8	15 26.8	N18 06.9	293 13.2	N18 16.8
	19	82 29.6	66 03.2	08.5	125 31.8	36.3	30 29.0	07.0	308 15.8	16.9
	20	97 32.1	81 04.5	09.3	140 32.3	35.7	45 31.1	07.1	323 18.4	16.9
	21	112 34.6	96 05.9	·· 10.2	155 32.8	·· 35.2	60 33.2	·· 07.2	338 21.1	·· 16.9
	22	127 37.0	111 07.2	11.1	170 33.3	34.6	75 35.4	07.3	353 23.7	17.0
	23	142 39.5	126 08.6	11.9	185 33.8	34.1	90 37.5	07.3	8 26.3	17.0
28	00	157 42.0	141 09.9	N12 12.8	200 34.3	S17 33.5	105 39.6	N18 07.4	23 29.0	N18 17.1
	01	172 44.4	156 11.3	13.7	215 34.8	33.0	120 41.8	07.5	38 31.6	17.1
	02	187 46.9	171 12.6	14.5	230 35.4	32.4	135 43.9	07.6	53 34.2	17.2
	03	202 49.4	186 14.0	·· 15.4	245 35.9	·· 31.9	150 46.0	·· 07.7	68 36.9	·· 17.2
	04	217 51.8	201 15.4	16.3	260 36.4	31.3	165 48.1	07.8	83 39.5	17.3
	05	232 54.3	216 16.7	17.1	275 36.9	30.8	180 50.3	07.9	98 42.1	17.3
	06	247 56.7	231 18.1	N12 18.0	290 37.4	S17 30.2	195 52.4	N18 08.0	113 44.8	N18 17.4
	07	262 59.2	246 19.5	18.8	305 37.9	29.6	210 54.5	08.1	128 47.4	17.4
	08	278 01.7	261 20.8	19.7	320 38.4	29.1	225 56.7	08.2	143 50.0	17.5
M	09	293 04.1	276 22.2	·· 20.6	335 38.9	·· 28.5	240 58.8	·· 08.2	158 52.6	·· 17.5
O	10	308 06.6	291 23.6	21.4	350 39.4	28.0	256 00.9	08.3	173 55.3	17.6
N	11	323 09.1	306 25.0	22.3	5 39.9	27.4	271 03.0	08.4	188 57.9	17.6
D	12	338 11.5	321 26.4	N12 23.1	20 40.5	S17 26.9	286 05.2	N18 08.5	204 00.5	N18 17.7
A	13	353 14.0	336 27.7	24.0	35 41.0	26.3	301 07.3	08.6	219 03.2	17.7
Y	14	8 16.5	351 29.1	24.8	50 41.5	25.7	316 09.4	08.7	234 05.8	17.8
	15	23 18.9	6 30.5	·· 25.7	65 42.0	·· 25.2	331 11.6	·· 08.8	249 08.4	·· 17.8
	16	38 21.4	21 31.9	26.5	80 42.5	24.6	346 13.7	08.9	264 11.1	17.9
	17	53 23.9	36 33.3	27.4	95 43.0	24.1	1 15.8	09.0	279 13.7	17.9
	18	68 26.3	51 34.7	N12 28.2	110 43.5	S17 23.5	16 17.9	N18 09.1	294 16.3	N18 18.0
	19	83 28.8	66 36.1	29.1	125 44.0	23.0	31 20.1	09.1	309 19.0	18.0
	20	98 31.2	81 37.5	29.9	140 44.6	22.4	46 22.2	09.2	324 21.6	18.1
	21	113 33.7	96 38.9	·· 30.8	155 45.1	·· 21.8	61 24.3	·· 09.3	339 24.2	·· 18.1
	22	128 36.2	111 40.3	31.6	170 45.6	21.3	76 26.4	09.4	354 26.9	18.1
	23	143 38.6	126 41.7	32.4	185 46.1	20.7	91 28.6	09.5	9 29.5	18.2
1	00	158 41.1	141 43.1	N12 33.3	200 46.6	S17 20.2	106 30.7	N18 09.6	24 32.1	N18 18.2
	01	173 43.6	156 44.6	34.1	215 47.1	19.6	121 32.8	09.7	39 34.7	18.3
	02	188 46.0	171 46.0	35.0	230 47.6	19.0	136 34.9	09.8	54 37.4	18.3
	03	203 48.5	186 47.4	·· 35.8	245 48.2	·· 18.5	151 37.1	·· 09.9	69 40.0	·· 18.4
	04	218 51.0	201 48.8	36.6	260 48.7	17.9	166 39.2	10.0	84 42.6	18.4
	05	233 53.4	216 50.2	37.5	275 49.2	17.3	181 41.3	10.1	99 45.3	18.5
	06	248 55.9	231 51.7	N12 38.3	290 49.7	S17 16.8	196 43.4	N18 10.1	114 47.9	N18 18.5
	07	263 58.4	246 53.1	39.1	305 50.2	16.2	211 45.5	10.2	129 50.5	18.6
T	08	279 00.8	261 54.5	40.0	320 50.7	15.7	226 47.7	10.3	144 53.2	18.6
U	09	294 03.3	276 56.0	·· 40.8	335 51.2	·· 15.1	241 49.8	·· 10.4	159 55.8	·· 18.7
E	10	309 05.7	291 57.4	41.6	350 51.8	14.5	256 51.9	10.5	174 58.4	18.7
S	11	324 08.2	306 58.8	42.5	5 52.3	14.0	271 54.0	10.6	190 01.0	18.8
D	12	339 10.7	322 00.3	N12 43.3	20 52.8	S17 13.4	286 56.2	N18 10.7	205 03.7	N18 18.8
A	13	354 13.1	337 01.7	44.1	35 53.3	12.8	301 58.3	10.8	220 06.3	18.9
Y	14	9 15.6	352 03.2	45.0	50 53.8	12.3	317 00.4	10.9	235 08.9	18.9
	15	24 18.1	7 04.6	·· 45.8	65 54.3	·· 11.7	332 02.5	·· 11.0	250 11.6	·· 18.9
	16	39 20.5	22 06.1	46.6	80 54.9	11.1	347 04.6	11.1	265 14.2	19.0
	17	54 23.0	37 07.5	47.4	95 55.4	10.6	2 06.8	11.1	280 16.8	19.0
	18	69 25.5	52 09.0	N12 48.2	110 55.9	S17 10.0	17 08.9	N18 11.2	295 19.4	N18 19.1
	19	84 27.9	67 10.5	49.1	125 56.4	09.4	32 11.0	11.3	310 22.1	19.1
	20	99 30.4	82 11.9	49.9	140 56.9	08.9	47 13.1	11.4	325 24.7	19.2
	21	114 32.8	97 13.4	·· 50.7	155 57.4	·· 08.3	62 15.2	·· 11.5	340 27.3	·· 19.2
	22	129 35.3	112 14.9	51.5	170 58.0	07.7	77 17.4	11.6	355 30.0	19.3
	23	144 37.8	127 16.3	52.3	185 58.5	07.2	92 19.5	11.7	10 32.6	19.3
Mer. Pass.		h m 13 27.0	v 1.4	d 0.9	v 0.5	d 0.6	v 2.1	d 0.1	v 2.6	d 0.0

STARS

Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 39.2	S40 24.1
Achernar	335 47.5	S57 21.4
Acrux	173 39.2	S62 58.3
Adhara	255 33.8	S28 56.8
Aldebaran	291 20.7	N16 27.7
Alioth	166 44.2	N56 04.8
Alkaid	153 20.1	N49 25.4
Al Na'ir	28 18.4	S47 04.3
Alnilam	276 14.0	S 1 13.2
Alphard	218 22.6	S 8 33.8
Alphecca	126 34.0	N26 47.3
Alpheratz	358 12.1	N28 57.9
Altair	62 35.1	N 8 48.4
Ankaa	353 43.0	S42 25.9
Antares	112 59.8	S26 22.8
Arcturus	146 20.5	N19 17.9
Atria	108 26.2	S68 58.9
Avior	234 28.6	S59 26.5
Bellatrix	279 01.2	N 6 19.6
Betelgeuse	271 30.7	N 7 24.0
Canopus	264 08.0	S52 41.4
Capella	281 14.7	N45 58.6
Deneb	49 50.4	N45 11.8
Denebola	183 01.2	N14 41.8
Diphda	349 23.5	S18 06.8
Dubhe	194 24.5	N61 52.3
Elnath	278 47.0	N28 35.3
Eltanin	90 59.0	N51 29.3
Enif	34 14.2	N 9 46.2
Fomalhaut	15 54.4	S29 44.7
Gacrux	172 30.8	S56 59.1
Gienah	176 20.1	S17 25.0
Hadar	149 26.2	S60 15.6
Hamal	328 31.8	N23 21.3
Kaus Aust.	84 20.2	S34 23.6
Kochab	137 18.5	N74 14.7
Markab	14 05.8	N15 04.9
Menkar	314 43.7	N 3 59.9
Menkent	148 39.5	S36 15.4
Miaplacidus	221 44.5	S69 37.7
Mirfak	309 19.6	N49 47.0
Nunki	76 32.3	S26 19.4
Peacock	54 02.7	S56 48.4
Pollux	244 00.8	N28 04.8
Procyon	245 28.0	N 5 16.8
Rasalhague	96 31.9	N12 34.5
Regulus	208 12.2	N12 04.5
Rigel	281 38.2	S 8 13.9
Rigil Kent.	140 28.6	S60 44.2
Sabik	102 43.9	S15 41.8
Schedar	350 12.1	N56 24.8
Shaula	96 59.1	S37 05.1
Sirius	258 57.6	S16 41.4
Spica	158 59.8	S11 02.6
Suhail	223 12.1	S43 20.7
Vega	80 57.6	N38 45.6
Zuben'ubi	137 35.5	S15 56.9

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	343 28.0	14 34
Mars	42 52.4	10 37
Jupiter	307 57.7	16 55
Saturn	225 47.0	22 22

	G.M.T.	SUN G.H.A.	SUN Dec.	MOON G.H.A.	v	Dec.	d	H.P.
d	h	° ′	° ′	° ′	′	° ′	′	′
27	00	176 47.2	S 8 27.8	79 28.2	11.9	N18 48.9	0.9	54.5
	01	191 47.3	26.9	93 59.1	11.9	18 49.8	0.9	54.6
	02	206 47.4	26.0	108 30.0	11.8	18 50.7	0.8	54.6
	03	221 47.5	·· 25.0	123 00.8	11.8	18 51.5	0.6	54.6
	04	236 47.6	24.1	137 31.6	11.8	18 52.1	0.6	54.6
	05	251 47.8	23.1	152 02.4	11.7	18 52.7	0.5	54.6
	06	266 47.9	S 8 22.2	166 33.1	11.7	N18 53.2	0.5	54.6
	07	281 48.0	21.3	181 03.8	11.8	18 53.7	0.3	54.6
	08	296 48.1	20.3	195 34.6	11.6	18 54.0	0.2	54.7
S	09	311 48.2	·· 19.4	210 05.2	11.7	18 54.2	0.2	54.7
U	10	326 48.3	18.4	224 35.9	11.7	18 54.4	0.1	54.7
N	11	341 48.4	17.5	239 06.6	11.6	18 54.5	0.1	54.7
D	12	356 48.5	S 8 16.6	253 37.2	11.6	N18 54.4	0.1	54.7
A	13	11 48.6	15.6	268 07.8	11.6	18 54.3	0.2	54.7
Y	14	26 48.8	14.7	282 38.4	11.5	18 54.1	0.3	54.8
	15	41 48.9	·· 13.7	297 08.9	11.6	18 53.8	0.4	54.8
	16	56 49.0	12.8	311 39.5	11.5	18 53.4	0.5	54.8
	17	71 49.1	11.9	326 10.0	11.5	18 52.9	0.6	54.8
	18	86 49.2	S 8 10.9	340 40.5	11.5	N18 52.3	0.6	54.8
	19	101 49.3	10.0	355 11.0	11.5	18 51.7	0.8	54.9
	20	116 49.4	09.0	9 41.5	11.4	18 50.9	0.8	54.9
	21	131 49.5	·· 08.1	24 11.9	11.4	18 50.1	1.0	54.9
	22	146 49.7	07.1	38 42.3	11.4	18 49.1	1.0	54.9
	23	161 49.8	06.2	53 12.7	11.4	18 48.1	1.1	54.9
28	00	176 49.9	S 8 05.3	67 43.1	11.4	N18 47.0	1.2	55.0
	01	191 50.0	04.3	82 13.5	11.3	18 45.8	1.4	55.0
	02	206 50.1	03.4	96 43.8	11.4	18 44.4	1.4	55.0
	03	221 50.2	·· 02.4	111 14.2	11.3	18 43.0	1.4	55.0
	04	236 50.4	01.5	125 44.5	11.3	18 41.6	1.6	55.0
	05	251 50.5	8 00.5	140 14.8	11.3	18 40.0	1.7	55.1
	06	266 50.6	S 7 59.6	154 45.1	11.2	N18 38.3	1.8	55.1
	07	281 50.7	58.6	169 15.3	11.3	18 36.5	1.8	55.1
	08	296 50.8	57.7	183 45.6	11.2	18 34.7	2.0	55.1
M	09	311 50.9	·· 56.8	198 15.8	11.2	18 32.7	2.1	55.1
O	10	326 51.0	55.8	212 46.0	11.2	18 30.6	2.1	55.2
N	11	341 51.2	54.9	227 16.2	11.2	18 28.5	2.2	55.2
D	12	356 51.3	S 7 53.9	241 46.4	11.2	N18 26.3	2.4	55.2
A	13	11 51.4	53.0	256 16.6	11.2	18 23.9	2.4	55.2
Y	14	26 51.5	52.0	270 46.8	11.1	18 21.5	2.5	55.3
	15	41 51.6	·· 51.1	285 16.9	11.1	18 19.0	2.6	55.3
	16	56 51.8	50.1	299 47.0	11.1	18 16.4	2.7	55.3
	17	71 51.9	49.2	314 17.1	11.1	18 13.7	2.8	55.3
	18	86 52.0	S 7 48.2	328 47.2	11.1	N18 10.9	2.9	55.4
	19	101 52.1	47.3	343 17.3	11.1	18 08.0	3.0	55.4
	20	116 52.2	46.3	357 47.4	11.0	18 05.0	3.0	55.4
	21	131 52.4	·· 45.4	12 17.4	11.1	18 02.0	3.2	55.4
	22	146 52.5	44.5	26 47.5	11.0	17 58.8	3.2	55.5
	23	161 52.6	43.5	41 17.5	11.0	17 55.6	3.4	55.5
1	00	176 52.7	S 7 42.6	55 47.5	11.0	N17 52.2	3.4	55.5
	01	191 52.8	41.6	70 17.5	11.0	17 48.8	3.6	55.5
	02	206 53.0	40.7	84 47.5	11.0	17 45.2	3.6	55.6
	03	221 53.1	·· 39.7	99 17.5	11.0	17 41.6	3.7	55.6
	04	236 53.2	38.8	113 47.5	11.0	17 37.9	3.8	55.6
	05	251 53.3	37.8	128 17.5	10.9	17 34.1	3.9	55.6
	06	266 53.4	S 7 36.9	142 47.4	10.9	N17 30.2	4.0	55.7
	07	281 53.6	35.9	157 17.3	11.0	17 26.2	4.1	55.7
	08	296 53.7	35.0	171 47.3	10.9	17 22.1	4.2	55.7
T	09	311 53.8	·· 34.0	186 17.2	10.9	17 17.9	4.3	55.8
U	10	326 53.9	33.1	200 47.1	10.9	17 13.6	4.3	55.8
E	11	341 54.1	32.1	215 17.0	10.9	17 09.3	4.5	55.8
S	12	356 54.2	S 7 31.2	229 46.9	10.8	N17 04.8	4.6	55.8
D	13	11 54.3	30.2	244 16.7	10.9	17 00.2	4.6	55.9
A	14	26 54.4	29.3	258 46.6	10.9	16 55.6	4.7	55.9
Y	15	41 54.5	·· 28.3	273 16.5	10.8	16 50.9	4.8	55.9
	16	56 54.7	27.4	287 46.3	10.9	16 46.1	5.0	56.0
	17	71 54.8	26.4	302 16.2	10.8	16 41.1	5.0	56.0
	18	86 54.9	S 7 25.5	316 46.0	10.8	N16 36.1	5.1	56.0
	19	101 55.0	24.5	331 15.8	10.8	16 31.0	5.1	56.0
	20	116 55.2	23.6	345 45.6	10.9	16 25.9	5.3	56.1
	21	131 55.3	·· 22.6	0 15.5	10.8	16 20.6	5.4	56.1
	22	146 55.4	21.7	14 45.3	10.7	16 15.2	5.4	56.1
	23	161 55.5	20.7	29 15.0	10.8	16 09.8	5.6	56.2
		S.D. 16.2	d 0.9	S.D.	14.9	15.0		15.2

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 27	Moonrise 28	Moonrise 1	Moonrise 2
°	h m	h m	h m	h m	h m	h m	h m
N 72	05 16	06 33	07 43	☐	☐	09 50	11 53
N 70	05 20	06 30	07 33	08 21	09 23	10 49	12 26
68	05 24	06 28	07 24	09 10	10 07	11 23	12 50
66	05 26	06 25	07 17	09 41	10 37	11 47	13 08
64	05 29	06 23	07 11	10 05	10 59	12 06	13 23
62	05 30	06 22	07 06	10 23	11 17	12 22	13 36
60	05 32	06 20	07 02	10 38	11 32	12 35	13 46
N 58	05 33	06 18	06 58	10 51	11 44	12 46	13 55
56	05 34	06 17	06 54	11 02	11 55	12 56	14 03
54	05 35	06 16	06 51	11 12	12 05	13 04	14 10
52	05 36	06 15	06 48	11 21	12 13	13 12	14 17
50	05 36	06 13	06 46	11 29	12 21	13 19	14 23
45	05 37	06 11	06 40	11 46	12 37	13 34	14 35
N 40	05 37	06 08	06 35	11 59	12 50	13 46	14 45
35	05 36	06 06	06 31	12 11	13 02	13 56	14 54
30	05 36	06 03	06 27	12 21	13 12	14 05	15 02
20	05 33	05 59	06 21	12 39	13 29	14 21	15 15
N 10	05 29	05 54	06 15	12 54	13 43	14 34	15 26
0	05 24	05 48	06 09	13 08	13 57	14 47	15 37
S 10	05 18	05 42	06 04	13 22	14 11	15 00	15 48
20	05 09	05 35	05 57	13 38	14 26	15 13	15 59
30	04 57	05 26	05 50	13 55	14 43	15 29	16 12
35	04 49	05 20	05 46	14 06	14 53	15 38	16 20
40	04 40	05 13	05 41	14 17	15 04	15 48	16 28
45	04 29	05 05	05 36	14 31	15 17	16 00	16 38
S 50	04 14	04 55	05 29	14 48	15 34	16 14	16 51
52	04 07	04 50	05 26	14 56	15 41	16 21	16 56
54	03 59	04 45	05 22	15 05	15 50	16 28	17 02
56	03 50	04 39	05 18	15 15	15 59	16 37	17 09
58	03 39	04 32	05 14	15 26	16 10	16 46	17 17
S 60	03 26	04 24	05 09	15 39	16 22	16 57	17 25

Lat.	Sunset	Twilight Civil	Twilight Naut.	Moonset 27	Moonset 28	Moonset 1	Moonset 2
°	h m	h m	h m	h m	h m	h m	h m
N 72	16 44	17 54	19 12	☐	☐	07 25	07 08
N 70	16 54	17 57	19 08	05 29	06 10	06 27	06 33
68	17 03	17 59	19 04	04 40	05 24	05 52	06 09
66	17 09	18 01	19 01	04 09	04 55	05 27	05 49
64	17 15	18 03	18 58	03 46	04 32	05 08	05 34
62	17 20	18 05	18 56	03 28	04 14	04 52	05 21
60	17 24	18 07	18 55	03 12	03 59	04 38	05 10
N 58	17 28	18 08	18 53	03 00	03 47	04 27	05 00
56	17 32	18 09	18 52	02 48	03 36	04 17	04 52
54	17 35	18 10	18 51	02 39	03 26	04 08	04 44
52	17 38	18 12	18 51	02 30	03 18	04 00	04 37
50	17 40	18 13	18 50	02 22	03 10	03 53	04 31
45	17 46	18 15	18 49	02 05	02 53	03 38	04 18
N 40	17 51	18 18	18 49	01 52	02 40	03 25	04 07
35	17 55	18 20	18 49	01 40	02 28	03 14	03 58
30	17 58	18 22	18 50	01 30	02 18	03 05	03 50
20	18 05	18 27	18 53	01 13	02 01	02 49	03 35
N 10	18 10	18 32	18 56	00 57	01 46	02 34	03 23
0	18 16	18 37	19 01	00 43	01 32	02 21	03 11
S 10	18 21	18 43	19 07	00 29	01 18	02 08	02 59
20	18 28	18 50	19 16	00 14	01 02	01 53	02 46
30	18 35	18 59	19 27	24 45	00 45	01 37	02 32
35	18 39	19 04	19 35	24 35	00 35	01 27	02 23
40	18 43	19 11	19 44	24 23	00 23	01 16	02 14
45	18 49	19 19	19 55	24 09	00 09	01 03	02 02
S 50	18 55	19 29	20 10	23 53	24 48	00 48	01 48
52	18 58	19 34	20 17	23 45	24 40	00 40	01 42
54	19 02	19 39	20 25	23 36	24 32	00 32	01 35
56	19 05	19 45	20 34	23 26	24 23	00 23	01 27
58	19 10	19 51	20 44	23 15	24 12	00 12	01 18
S 60	19 14	19 59	20 56	23 02	24 00	00 00	01 07

Day	SUN Eqn. of Time 00ʰ	SUN Eqn. of Time 12ʰ	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
	m s	m s	h m	h m	h m	d	
27	12 51	12 46	12 13	19 20	06 56	09	◐
28	12 41	12 35	12 13	20 09	07 44	10	
1	12 29	12 24	12 12	20 59	08 34	11	

G.M.T.	ARIES	VENUS −4.3		MARS +1.4		JUPITER −1.8		SATURN +0.2	
	G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
d h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
2 00	159 40.2	142 17.8	N12 53.1	200 59.0	S17 06.6	107 21.6	N18 11.8	25 35.2	N18 19.4
01	174 42.7	157 19.3	54.0	215 59.5	06.0	122 23.7	11.9	40 37.8	19.4
02	189 45.2	172 20.8	54.8	231 00.0	05.5	137 25.8	12.0	55 40.5	19.5
03	204 47.6	187 22.2	·· 55.6	246 00.5	·· 04.9	152 27.9	·· 12.1	70 43.1	·· 19.5
04	219 50.1	202 23.7	56.4	261 01.1	04.3	167 30.1	12.2	85 45.7	19.6
05	234 52.6	217 25.2	57.2	276 01.6	03.8	182 32.2	12.3	100 48.4	19.6
06	249 55.0	232 26.7	N12 58.0	291 02.1	S17 03.2	197 34.3	N18 12.3	115 51.0	N18 19.6
W 07	264 57.5	247 28.2	58.8	306 02.6	02.6	212 36.4	12.4	130 53.6	19.7
E 08	280 00.0	262 29.7	12 59.6	321 03.1	02.1	227 38.5	12.5	145 56.2	19.7
D 09	295 02.4	277 31.2	13 00.4	336 03.7	·· 01.5	242 40.6	·· 12.6	160 58.9	·· 19.8
N 10	310 04.9	292 32.7	01.2	351 04.2	00.9	257 42.8	12.7	176 01.5	19.8
E 11	325 07.3	307 34.2	02.0	6 04.7	17 00.3	272 44.9	12.8	191 04.1	19.9
S 12	340 09.8	322 35.7	N13 02.8	21 05.2	S16 59.8	287 47.0	N18 12.9	206 06.7	N18 19.9
D 13	355 12.3	337 37.2	03.6	36 05.7	59.2	302 49.1	13.0	221 09.4	20.0
A 14	10 14.7	352 38.7	04.4	51 06.3	58.6	317 51.2	13.1	236 12.0	20.0
Y 15	25 17.2	7 40.2	·· 05.2	66 06.8	·· 58.1	332 53.3	·· 13.2	251 14.6	·· 20.1
16	40 19.7	22 41.7	06.0	81 07.3	57.5	347 55.4	13.3	266 17.2	20.1
17	55 22.1	37 43.3	06.8	96 07.8	56.9	2 57.6	13.4	281 19.9	20.2
18	70 24.6	52 44.8	N13 07.6	111 08.3	S16 56.3	17 59.7	N18 13.5	296 22.5	N18 20.2
19	85 27.1	67 46.3	08.4	126 08.9	55.8	33 01.8	13.5	311 25.1	20.2
20	100 29.5	82 47.8	09.2	141 09.4	55.2	48 03.9	13.6	326 27.7	20.3
21	115 32.0	97 49.4	·· 10.0	156 09.9	·· 54.6	63 06.0	·· 13.7	341 30.4	·· 20.3
22	130 34.5	112 50.9	10.8	171 10.4	54.0	78 08.1	13.8	356 33.0	20.4
23	145 36.9	127 52.4	11.6	186 10.9	53.5	93 10.2	13.9	11 35.6	20.4
3 00	160 39.4	142 54.0	N13 12.4	201 11.5	S16 52.9	108 12.4	N18 14.0	26 38.2	N18 20.5
01	175 41.8	157 55.5	13.1	216 12.0	52.3	123 14.5	14.1	41 40.9	20.5
02	190 44.3	172 57.1	13.9	231 12.5	51.7	138 16.6	14.2	56 43.5	20.6
03	205 46.8	187 58.6	·· 14.7	246 13.0	·· 51.2	153 18.7	·· 14.3	71 46.1	·· 20.6
04	220 49.2	203 00.1	15.5	261 13.6	50.6	168 20.8	14.4	86 48.7	20.7
05	235 51.7	218 01.7	16.3	276 14.1	50.0	183 22.9	14.5	101 51.4	20.7
06	250 54.2	233 03.3	N13 17.1	291 14.6	S16 49.4	198 25.0	N18 14.6	116 54.0	N18 20.7
07	265 56.6	248 04.8	17.8	306 15.1	48.9	213 27.1	14.7	131 56.6	20.8
T 08	280 59.1	263 06.4	18.6	321 15.6	48.3	228 29.2	14.8	146 59.2	20.8
H 09	296 01.6	278 07.9	·· 19.4	336 16.2	·· 47.7	243 31.4	·· 14.8	162 01.9	·· 20.9
U 10	311 04.0	293 09.5	20.2	351 16.7	47.1	258 33.5	14.9	177 04.5	20.9
R 11	326 06.5	308 11.1	20.9	6 17.2	46.5	273 35.6	15.0	192 07.1	21.0
S 12	341 08.9	323 12.6	N13 21.7	21 17.7	S16 46.0	288 37.7	N18 15.1	207 09.7	N18 21.0
D 13	356 11.4	338 14.2	22.5	36 18.3	45.4	303 39.8	15.2	222 12.4	21.1
A 14	11 13.9	353 15.8	23.3	51 18.8	44.8	318 41.9	15.3	237 15.0	21.1
Y 15	26 16.3	8 17.4	·· 24.0	66 19.3	·· 44.2	333 44.0	·· 15.4	252 17.6	·· 21.1
16	41 18.8	23 18.9	24.8	81 19.8	43.6	348 46.1	15.5	267 20.2	21.2
17	56 21.3	38 20.5	25.6	96 20.4	43.1	3 48.2	15.6	282 22.8	21.2
18	71 23.7	53 22.1	N13 26.3	111 20.9	S16 42.5	18 50.3	N18 15.7	297 25.5	N18 21.3
19	86 26.2	68 23.7	27.1	126 21.4	41.9	33 52.4	15.8	312 28.1	21.3
20	101 28.7	83 25.3	27.9	141 21.9	41.3	48 54.5	15.9	327 30.7	21.4
21	116 31.1	98 26.9	·· 28.6	156 22.5	·· 40.7	63 56.6	·· 16.0	342 33.3	·· 21.4
22	131 33.6	113 28.5	29.4	171 23.0	40.2	78 58.8	16.1	357 36.0	21.5
23	146 36.1	128 30.1	30.1	186 23.5	39.6	94 00.9	16.2	12 38.6	21.5
4 00	161 38.5	143 31.7	N13 30.9	201 24.0	S16 39.0	109 03.0	N18 16.3	27 41.2	N18 21.5
01	176 41.0	158 33.3	31.7	216 24.6	38.4	124 05.1	16.3	42 43.8	21.6
02	191 43.4	173 34.9	32.4	231 25.1	37.8	139 07.2	16.4	57 46.4	21.6
03	206 45.9	188 36.5	·· 33.2	246 25.6	·· 37.2	154 09.3	·· 16.5	72 49.1	·· 21.7
04	221 48.4	203 38.1	33.9	261 26.2	36.7	169 11.4	16.6	87 51.7	21.7
05	236 50.8	218 39.8	34.7	276 26.7	36.1	184 13.5	16.7	102 54.3	21.8
06	251 53.3	233 41.4	N13 35.4	291 27.2	S16 35.5	199 15.6	N18 16.8	117 56.9	N18 21.8
07	266 55.8	248 43.0	36.2	306 27.7	34.9	214 17.7	16.9	132 59.5	21.9
08	281 58.2	263 44.6	36.9	321 28.3	34.3	229 19.8	17.0	148 02.2	21.9
F 09	297 00.7	278 46.3	·· 37.7	336 28.8	·· 33.7	244 21.9	·· 17.1	163 04.8	·· 21.9
R 10	312 03.2	293 47.9	38.4	351 29.3	33.2	259 24.0	17.2	178 07.4	22.0
I 11	327 05.6	308 49.5	39.2	6 29.8	32.6	274 26.1	17.3	193 10.0	22.0
D 12	342 08.1	323 51.2	N13 39.9	21 30.4	S16 32.0	289 28.2	N18 17.4	208 12.6	N18 22.1
A 13	357 10.6	338 52.8	40.7	36 30.9	31.4	304 30.3	17.5	223 15.3	22.1
Y 14	12 13.0	353 54.4	41.4	51 31.4	30.8	319 32.4	17.6	238 17.9	22.2
15	27 15.5	8 56.1	·· 42.1	66 32.0	·· 30.2	334 34.5	·· 17.7	253 20.5	·· 22.2
16	42 17.9	23 57.7	42.9	81 32.5	29.6	349 36.6	17.8	268 23.1	22.3
17	57 20.4	38 59.4	43.6	96 33.0	29.0	4 38.7	17.9	283 25.7	22.3
18	72 22.9	54 01.0	N13 44.3	111 33.5	S16 28.5	19 40.8	N18 18.0	298 28.4	N18 22.3
19	87 25.3	69 02.7	45.1	126 34.1	27.9	34 42.9	18.0	313 31.0	22.4
20	102 27.8	84 04.4	45.8	141 34.6	27.3	49 45.0	18.1	328 33.6	22.4
21	117 30.3	99 06.0	·· 46.5	156 35.1	·· 26.7	64 47.1	·· 18.2	343 36.2	·· 22.5
22	132 32.7	114 07.7	47.3	171 35.7	26.1	79 49.2	18.3	358 38.8	22.5
23	147 35.2	129 09.4	48.0	186 36.2	25.5	94 51.3	18.4	13 41.5	22.6
Mer. Pass.	h m 13 15.2	v 1.6	d 0.8	v 0.5	d 0.6	v 2.1	d 0.1	v 2.6	d 0.0

STARS		
Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 39.2	S40 24.1
Achernar	335 47.5	S57 21.4
Acrux	173 39.2	S62 58.3
Adhara	255 33.8	S28 56.8
Aldebaran	291 20.7	N16 27.7
Alioth	166 44.2	N56 04.8
Alkaid	153 20.1	N49 25.4
Al Na'ir	28 18.4	S47 04.3
Alnilam	276 14.0	S 1 13.2
Alphard	218 22.6	S 8 33.8
Alphecca	126 34.0	N26 47.3
Alpheratz	358 12.1	N28 57.9
Altair	62 35.1	N 8 48.4
Ankaa	353 43.0	S42 25.9
Antares	112 59.7	S26 22.8
Arcturus	146 20.4	N19 17.9
Atria	108 26.1	S68 58.9
Avior	234 28.6	S59 26.5
Bellatrix	279 01.2	N 6 19.6
Betelgeuse	271 30.7	N 7 24.0
Canopus	264 08.0	S52 41.4
Capella	281 14.7	N45 58.6
Deneb	49 50.4	N45 11.8
Denebola	183 01.2	N14 41.8
Diphda	349 23.5	S18 06.8
Dubhe	194 24.4	N61 52.3
Elnath	278 47.1	N28 35.3
Eltanin	90 59.0	N51 29.3
Enif	34 14.2	N 9 46.2
Fomalhaut	15 54.4	S29 44.6
Gacrux	172 30.8	S56 59.1
Gienah	176 20.1	S17 25.1
Hadar	149 26.2	S60 15.7
Hamal	328 31.8	N23 21.3
Kaus Aust.	84 20.1	S34 23.6
Kochab	137 18.5	N74 14.7
Markab	14 05.8	N15 04.9
Menkar	314 43.7	N 3 59.9
Menkent	148 39.5	S36 15.4
Miaplacidus	221 44.5	S69 37.7
Mirfak	309 19.6	N49 47.0
Nunki	76 32.3	S26 19.4
Peacock	54 02.6	S56 48.4
Pollux	244 00.8	N28 04.8
Procyon	245 28.0	N 5 16.8
Rasalhague	96 31.9	N12 34.5
Regulus	208 12.2	N12 04.5
Rigel	281 38.3	S 8 13.9
Rigil Kent.	140 28.6	S60 44.2
Sabik	102 43.9	S15 41.8
Schedar	350 12.1	N56 24.8
Shaula	96 59.0	S37 05.1
Sirius	258 57.6	S16 41.4
Spica	158 59.8	S11 02.7
Suhail	223 12.1	S43 20.7
Vega	80 57.6	N38 45.6
Zuben'ubi	137 35.5	S15 56.9

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	342 14.6	14 27
Mars	40 32.1	10 35
Jupiter	307 33.0	16 45
Saturn	225 58.9	22 10

	G.M.T.	SUN G.H.A.	SUN Dec.	MOON G.H.A.	MOON v	MOON Dec.	MOON d	MOON H.P.
	d h	° ′	° ′	° ′	′	° ′	′	′
	2 00	176 55.7	S 7 19.7	43 44.8	10.8	N16 04.2	5.6	56.2
	01	191 55.8	18.8	58 14.6	10.8	15 58.6	5.7	56.2
	02	206 55.9	17.8	72 44.4	10.8	15 52.9	5.8	56.2
	03	221 56.0	·· 16.9	87 14.2	10.7	15 47.1	5.9	56.3
	04	236 56.2	15.9	101 43.9	10.8	15 41.2	6.0	56.3
	05	251 56.3	15.0	116 13.7	10.7	15 35.2	6.1	56.3
	06	266 56.4	S 7 14.0	130 43.4	10.7	N15 29.1	6.1	56.4
W	07	281 56.6	13.1	145 13.1	10.8	15 23.0	6.3	56.4
E	08	296 56.7	12.1	159 42.9	10.7	15 16.7	6.3	56.4
D	09	311 56.8	·· 11.2	174 12.6	10.7	15 10.4	6.4	56.5
N	10	326 56.9	10.2	188 42.3	10.8	15 04.0	6.5	56.5
E	11	341 57.1	09.3	203 12.1	10.7	14 57.5	6.6	56.5
S	12	356 57.2	S 7 08.3	217 41.8	10.7	N14 50.9	6.7	56.6
D	13	11 57.3	07.3	232 11.5	10.7	14 44.2	6.7	56.6
A	14	26 57.5	06.4	246 41.2	10.7	14 37.5	6.9	56.6
Y	15	41 57.6	·· 05.4	261 10.9	10.7	14 30.6	6.9	56.6
	16	56 57.7	04.5	275 40.6	10.6	14 23.7	7.0	56.7
	17	71 57.8	03.5	290 10.2	10.7	14 16.7	7.1	56.7
	18	86 58.0	S 7 02.6	304 39.9	10.7	N14 09.6	7.2	56.7
	19	101 58.1	01.6	319 09.6	10.7	14 02.4	7.2	56.8
	20	116 58.2	7 00.7	333 39.3	10.6	13 55.2	7.4	56.8
	21	131 58.4	6 59.7	348 08.9	10.7	13 47.8	7.4	56.8
	22	146 58.5	58.7	2 38.6	10.6	13 40.4	7.5	56.9
	23	161 58.6	57.8	17 08.2	10.7	13 32.9	7.5	56.9
	3 00	176 58.8	S 6 56.8	31 37.9	10.6	N13 25.4	7.7	56.9
	01	191 58.9	55.9	46 07.5	10.7	13 17.7	7.7	57.0
	02	206 59.0	54.9	60 37.2	10.6	13 10.0	7.9	57.0
	03	221 59.1	·· 54.0	75 06.8	10.7	13 02.1	7.9	57.0
	04	236 59.3	53.0	89 36.5	10.6	12 54.2	7.9	57.1
	05	251 59.4	52.0	104 06.1	10.6	12 46.3	8.1	57.1
	06	266 59.5	S 6 51.1	118 35.7	10.6	N12 38.2	8.1	57.1
	07	281 59.7	50.1	133 05.3	10.6	12 30.1	8.2	57.2
T	08	296 59.8	49.2	147 34.9	10.7	12 21.9	8.3	57.2
H	09	311 59.9	·· 48.2	162 04.6	10.6	12 13.6	8.3	57.2
U	10	327 00.1	47.3	176 34.2	10.6	12 05.3	8.4	57.3
R	11	342 00.2	46.3	191 03.8	10.6	11 56.9	8.5	57.3
S	12	357 00.3	S 6 45.3	205 33.4	10.5	N11 48.4	8.6	57.3
D	13	12 00.5	44.4	220 02.9	10.6	11 39.8	8.7	57.3
A	14	27 00.6	43.4	234 32.5	10.6	11 31.1	8.7	57.4
Y	15	42 00.7	·· 42.5	249 02.1	10.6	11 22.4	8.7	57.4
	16	57 00.9	41.5	263 31.7	10.6	11 13.7	8.9	57.4
	17	72 01.0	40.5	278 01.3	10.5	11 04.8	8.9	57.5
	18	87 01.1	S 6 39.6	292 30.8	10.6	N10 55.9	9.0	57.5
	19	102 01.3	38.6	307 00.4	10.5	10 46.9	9.1	57.5
	20	117 01.4	37.7	321 29.9	10.6	10 37.8	9.1	57.6
	21	132 01.5	·· 36.7	335 59.5	10.5	10 28.7	9.2	57.6
	22	147 01.7	35.7	350 29.0	10.6	10 19.5	9.3	57.6
	23	162 01.8	34.8	4 58.6	10.5	10 10.2	9.3	57.7
	4 00	177 02.0	S 6 33.8	19 28.1	10.5	N10 00.9	9.4	57.7
	01	192 02.1	32.9	33 57.6	10.5	9 51.5	9.4	57.7
	02	207 02.2	31.9	48 27.1	10.6	9 42.1	9.5	57.8
	03	222 02.4	·· 30.9	62 56.7	10.5	9 32.6	9.6	57.8
	04	237 02.5	30.0	77 26.2	10.5	9 23.0	9.7	57.8
	05	252 02.6	29.0	91 55.7	10.5	9 13.3	9.7	57.9
	06	267 02.8	S 6 28.1	106 25.2	10.5	N 9 03.6	9.7	57.9
	07	282 02.9	27.1	120 54.7	10.4	8 53.9	9.8	57.9
	08	297 03.1	26.1	135 24.1	10.5	8 44.1	9.9	57.9
F	09	312 03.2	·· 25.2	149 53.6	10.5	8 34.2	10.0	58.0
R	10	327 03.3	24.2	164 23.1	10.4	8 24.2	10.0	58.0
I	11	342 03.5	23.2	178 52.5	10.5	8 14.2	10.0	58.0
D	12	357 03.6	S 6 22.3	193 22.0	10.4	N 8 04.2	10.1	58.1
A	13	12 03.7	21.3	207 51.4	10.5	7 54.1	10.2	58.1
Y	14	27 03.9	20.4	222 20.9	10.4	7 43.9	10.2	58.1
	15	42 04.0	·· 19.4	236 50.3	10.4	7 33.7	10.2	58.2
	16	57 04.2	18.4	251 19.7	10.4	7 23.5	10.3	58.2
	17	72 04.3	17.5	265 49.1	10.4	7 13.2	10.4	58.2
	18	87 04.4	S 6 16.5	280 18.5	10.4	N 7 02.8	10.4	58.2
	19	102 04.6	15.5	294 47.9	10.4	6 52.4	10.5	58.3
	20	117 04.7	14.6	309 17.3	10.3	6 41.9	10.5	58.3
	21	132 04.9	·· 13.6	323 46.6	10.4	6 31.4	10.5	58.3
	22	147 05.0	12.7	338 16.0	10.3	6 20.9	10.6	58.4
	23	162 05.1	11.7	352 45.3	10.4	6 10.3	10.7	58.4
		S.D. 16.2	*d* 1.0	S.D. 15.4		15.6		15.8

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 2	Moonrise 3	Moonrise 4	Moonrise 5
°	h m	h m	h m	h m	h m	h m	h m
N 72	05 01	06 19	07 27	11 53	13 48	15 41	17 35
N 70	05 07	06 17	07 19	12 26	14 08	15 52	17 39
68	05 12	06 16	07 12	12 50	14 24	16 01	17 42
66	05 15	06 15	07 06	13 08	14 36	16 09	17 44
64	05 19	06 13	07 01	13 23	14 47	16 15	17 46
62	05 21	06 12	06 57	13 36	14 56	16 21	17 48
60	05 23	06 11	06 53	13 46	15 04	16 25	17 50
N 58	05 25	06 11	06 50	13 55	15 10	16 29	17 51
56	05 27	06 10	06 47	14 03	15 16	16 33	17 53
54	05 28	06 09	06 44	14 10	15 22	16 36	17 54
52	05 29	06 08	06 42	14 17	15 26	16 39	17 55
50	05 30	06 07	06 40	14 23	15 31	16 42	17 56
45	05 32	06 05	06 35	14 35	15 40	16 48	17 58
N 40	05 32	06 04	06 31	14 45	15 48	16 53	18 00
35	05 33	06 02	06 27	14 54	15 54	16 57	18 01
30	05 32	06 00	06 24	15 02	16 00	17 01	18 03
20	05 31	05 56	06 18	15 15	16 10	17 07	18 05
N 10	05 28	05 52	06 13	15 26	16 19	17 13	18 07
0	05 24	05 48	06 09	15 37	16 27	17 18	18 09
S 10	05 18	05 43	06 04	15 48	16 36	17 23	18 11
20	05 10	05 36	05 58	15 59	16 44	17 29	18 13
30	04 59	05 28	05 52	16 12	16 54	17 35	18 15
35	04 53	05 23	05 49	16 20	17 00	17 39	18 17
40	04 44	05 17	05 44	16 28	17 07	17 43	18 18
45	04 34	05 10	05 40	16 38	17 14	17 48	18 20
S 50	04 20	05 00	05 34	16 51	17 23	17 53	18 22
52	04 13	04 56	05 31	16 56	17 27	17 56	18 23
54	04 06	04 51	05 28	17 02	17 32	17 59	18 24
56	03 58	04 46	05 25	17 09	17 37	18 02	18 25
58	03 48	04 40	05 21	17 17	17 43	18 06	18 27
S 60	03 36	04 33	05 17	17 25	17 49	18 09	18 28

Lat.	Sunset	Twilight Civil	Twilight Naut.	Moonset 2	Moonset 3	Moonset 4	Moonset 5
°	h m	h m	h m	h m	h m	h m	h m
N 72	16 59	18 08	19 26	07 08	06 58	06 50	06 43
N 70	17 07	18 09	19 20	06 33	06 36	06 36	06 36
68	17 14	18 10	19 15	06 09	06 19	06 26	06 31
66	17 20	18 11	19 11	05 49	06 05	06 17	06 27
64	17 24	18 12	19 07	05 34	05 54	06 09	06 23
62	17 28	18 13	19 04	05 21	05 44	06 03	06 20
60	17 32	18 14	19 02	05 10	05 36	05 57	06 17
N 58	17 35	18 15	19 00	05 00	05 28	05 52	06 14
56	17 38	18 15	18 58	04 52	05 22	05 48	06 12
54	17 41	18 16	18 57	04 44	05 16	05 44	06 10
52	17 43	18 17	18 56	04 37	05 10	05 40	06 08
50	17 45	18 18	18 55	04 31	05 06	05 37	06 06
45	17 50	18 19	18 53	04 18	04 55	05 30	06 02
N 40	17 54	18 21	18 52	04 07	04 46	05 23	05 59
35	17 57	18 23	18 52	03 58	04 39	05 18	05 56
30	18 00	18 24	18 52	03 50	04 32	05 14	05 54
20	18 06	18 28	18 53	03 35	04 21	05 05	05 50
N 10	18 11	18 32	18 56	03 23	04 11	04 58	05 46
0	18 15	18 36	19 00	03 11	04 01	04 51	05 42
S 10	18 20	18 41	19 06	02 59	03 51	04 45	05 38
20	18 25	18 47	19 13	02 46	03 41	04 37	05 35
30	18 31	18 55	19 24	02 32	03 29	04 29	05 30
35	18 35	19 00	19 31	02 23	03 23	04 24	05 27
40	18 39	19 06	19 39	02 14	03 15	04 18	05 24
45	18 43	19 13	19 49	02 02	03 05	04 12	05 21
S 50	18 49	19 22	20 03	01 48	02 54	04 04	05 17
52	18 52	19 27	20 09	01 42	02 49	04 01	05 15
54	18 55	19 31	20 16	01 35	02 44	03 57	05 13
56	18 58	19 36	20 24	01 27	02 37	03 52	05 10
58	19 01	19 42	20 34	01 18	02 30	03 47	05 08
S 60	19 05	19 49	20 45	01 07	02 22	03 42	05 05

Day	SUN Eqn. of Time 00ʰ	SUN Eqn. of Time 12ʰ	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
	m s	m s	h m	h m	h m	d	
2	12 18	12 11	12 12	21 49	09 24	12	
3	12 05	11 59	12 12	22 39	10 14	13	○
4	11 52	11 46	12 12	23 30	11 05	14	

1977 MARCH 5, 6, 7 (SAT., SUN., MON.)

G.M.T.	ARIES	VENUS −4.3		MARS +1.4		JUPITER −1.8		SATURN +0.2	
	G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
d h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
5 00	162 37.7	144 11.0	N13 48.7	201 36.7	S16 24.9	109 53.4	N18 18.5	28 44.1	N18 22.6
01	177 40.1	159 12.7	49.5	216 37.3	24.3	124 55.5	18.6	43 46.7	22.6
02	192 42.6	174 14.4	50.2	231 37.8	23.7	139 57.6	18.7	58 49.3	22.7
03	207 45.0	189 16.1	·· 50.9	246 38.3	·· 23.2	154 59.7	·· 18.8	73 51.9	·· 22.7
04	222 47.5	204 17.7	51.6	261 38.8	22.6	170 01.8	18.9	88 54.6	22.8
05	237 50.0	219 19.4	52.4	276 39.4	22.0	185 03.9	19.0	103 57.2	22.8
06	252 52.4	234 21.1	N13 53.1	291 39.9	S16 21.4	200 06.0	N18 19.1	118 59.8	N18 22.9
07	267 54.9	249 22.8	53.8	306 40.4	20.8	215 08.1	19.2	134 02.4	22.9
S 08	282 57.4	264 24.5	54.5	321 41.0	20.2	230 10.2	19.3	149 05.0	23.0
A 09	297 59.8	279 26.2	·· 55.2	336 41.5	·· 19.6	245 12.3	·· 19.4	164 07.6	·· 23.0
T 10	313 02.3	294 27.9	55.9	351 42.0	19.0	260 14.4	19.5	179 10.3	23.0
U 11	328 04.8	309 29.6	56.7	6 42.6	18.4	275 16.5	19.6	194 12.9	23.1
R 12	343 07.2	324 31.3	N13 57.4	21 43.1	S16 17.8	290 18.6	N18 19.7	209 15.5	N18 23.1
D 13	358 09.7	339 33.0	58.1	36 43.6	17.2	305 20.7	19.8	224 18.1	23.2
A 14	13 12.2	354 34.7	58.8	51 44.2	16.6	320 22.8	19.9	239 20.7	23.2
Y 15	28 14.6	9 36.5	13 59.5	66 44.7	·· 16.1	335 24.9	·· 19.9	254 23.3	·· 23.3
16	43 17.1	24 38.2	14 00.2	81 45.2	15.5	350 27.0	20.0	269 26.0	23.3
17	58 19.5	39 39.9	00.9	96 45.8	14.9	5 29.1	20.1	284 28.6	23.3
18	73 22.0	54 41.6	N14 01.6	111 46.3	S16 14.3	20 31.2	N18 20.2	299 31.2	N18 23.4
19	88 24.5	69 43.4	02.3	126 46.8	13.7	35 33.3	20.3	314 33.8	23.4
20	103 26.9	84 45.1	03.0	141 47.4	13.1	50 35.4	20.4	329 36.4	23.5
21	118 29.4	99 46.8	·· 03.7	156 47.9	·· 12.5	65 37.5	·· 20.5	344 39.0	·· 23.5
22	133 31.9	114 48.6	04.4	171 48.4	11.9	80 39.6	20.6	359 41.7	23.6
23	148 34.3	129 50.3	05.1	186 49.0	11.3	95 41.7	20.7	14 44.3	23.6
6 00	163 36.8	144 52.0	N14 05.8	201 49.5	S16 10.7	110 43.8	N18 20.8	29 46.9	N18 23.6
01	178 39.3	159 53.8	06.5	216 50.0	10.1	125 45.9	20.9	44 49.5	23.7
02	193 41.7	174 55.5	07.2	231 50.6	09.5	140 48.0	21.0	59 52.1	23.7
03	208 44.2	189 57.3	·· 07.9	246 51.1	·· 08.9	155 50.1	·· 21.1	74 54.7	·· 23.8
04	223 46.7	204 59.0	08.6	261 51.6	08.3	170 52.2	21.2	89 57.3	23.8
05	238 49.1	220 00.8	09.3	276 52.2	07.7	185 54.2	21.3	105 00.0	23.8
06	253 51.6	235 02.6	N14 10.0	291 52.7	S16 07.1	200 56.3	N18 21.4	120 02.6	N18 23.9
07	268 54.0	250 04.3	10.7	306 53.2	06.5	215 58.4	21.5	135 05.2	23.9
08	283 56.5	265 06.1	11.3	321 53.8	05.9	231 00.5	21.6	150 07.8	24.0
S 09	298 59.0	280 07.9	·· 12.0	336 54.3	·· 05.3	246 02.6	·· 21.7	165 10.4	·· 24.0
U 10	314 01.4	295 09.6	12.7	351 54.9	04.7	261 04.7	21.8	180 13.0	24.1
N 11	329 03.9	310 11.4	13.4	6 55.4	04.1	276 06.8	21.9	195 15.6	24.1
D 12	344 06.4	325 13.2	N14 14.1	21 55.9	S16 03.5	291 08.9	N18 22.0	210 18.3	N18 24.1
A 13	359 08.8	340 15.0	14.8	36 56.5	02.9	306 11.0	22.1	225 20.9	24.2
Y 14	14 11.3	355 16.8	15.4	51 57.0	02.3	321 13.1	22.2	240 23.5	24.2
15	29 13.8	10 18.6	·· 16.1	66 57.5	·· 01.7	336 15.2	·· 22.3	255 26.1	·· 24.3
16	44 16.2	25 20.3	16.8	81 58.1	01.1	351 17.3	22.4	270 28.7	24.3
17	59 18.7	40 22.1	17.5	96 58.6	16 00.5	6 19.3	22.4	285 31.3	24.4
18	74 21.1	55 23.9	N14 18.1	111 59.1	S15 59.9	21 21.4	N18 22.5	300 33.9	N18 24.4
19	89 23.6	70 25.7	18.8	126 59.7	59.3	36 23.5	22.6	315 36.5	24.4
20	104 26.1	85 27.5	19.5	142 00.2	58.7	51 25.6	22.7	330 39.2	24.5
21	119 28.5	100 29.4	·· 20.1	157 00.8	·· 58.1	66 27.7	·· 22.8	345 41.8	·· 24.5
22	134 31.0	115 31.2	20.8	172 01.3	57.5	81 29.8	22.9	0 44.4	24.6
23	149 33.5	130 33.0	21.5	187 01.8	56.9	96 31.9	23.0	15 47.0	24.6
7 00	164 35.9	145 34.8	N14 22.1	202 02.4	S15 56.3	111 34.0	N18 23.1	30 49.6	N18 24.6
01	179 38.4	160 36.6	22.8	217 02.9	55.7	126 36.1	23.2	45 52.2	24.7
02	194 40.9	175 38.4	23.5	232 03.5	55.1	141 38.1	23.3	60 54.8	24.7
03	209 43.3	190 40.3	·· 24.1	247 04.0	·· 54.5	156 40.2	·· 23.4	75 57.4	·· 24.8
04	224 45.8	205 42.1	24.8	262 04.5	53.9	171 42.3	23.5	91 00.1	24.8
05	239 48.3	220 43.9	25.4	277 05.1	53.3	186 44.4	23.6	106 02.7	24.8
06	254 50.7	235 45.8	N14 26.1	292 05.6	S15 52.7	201 46.5	N18 23.7	121 05.3	N18 24.9
07	269 53.2	250 47.6	26.7	307 06.1	52.1	216 48.6	23.8	136 07.9	24.9
08	284 55.6	265 49.4	27.4	322 06.7	51.5	231 50.7	23.9	151 10.5	25.0
M 09	299 58.1	280 51.3	·· 28.0	337 07.2	·· 50.9	246 52.8	·· 24.0	166 13.1	·· 25.0
O 10	315 00.6	295 53.1	28.7	352 07.8	50.2	261 54.8	24.1	181 15.7	25.1
N 11	330 03.0	310 55.0	29.3	7 08.3	49.6	276 56.9	24.2	196 18.3	25.1
D 12	345 05.5	325 56.8	N14 30.0	22 08.8	S15 49.0	291 59.0	N18 24.3	211 20.9	N18 25.1
A 13	0 08.0	340 58.7	30.6	37 09.4	48.4	307 01.1	24.4	226 23.6	25.2
Y 14	15 10.4	356 00.6	31.3	52 09.9	47.8	322 03.2	24.5	241 26.2	25.2
15	30 12.9	11 02.4	·· 31.9	67 10.5	·· 47.2	337 05.3	·· 24.6	256 28.8	·· 25.3
16	45 15.4	26 04.3	32.6	82 11.0	46.6	352 07.4	24.7	271 31.4	25.3
17	60 17.8	41 06.2	33.2	97 11.6	46.0	7 09.4	24.8	286 34.0	25.3
18	75 20.3	56 08.0	N14 33.8	112 12.1	S15 45.4	22 11.5	N18 24.9	301 36.6	N18 25.4
19	90 22.8	71 09.9	34.5	127 12.6	44.8	37 13.6	25.0	316 39.2	25.4
20	105 25.2	86 11.8	35.1	142 13.2	44.2	52 15.7	25.1	331 41.8	25.5
21	120 27.7	101 13.7	·· 35.7	157 13.7	·· 43.6	67 17.8	·· 25.2	346 44.4	·· 25.5
22	135 30.1	116 15.5	36.4	172 14.3	43.0	82 19.9	25.3	1 47.0	25.5
23	150 32.6	131 17.4	37.0	187 14.8	42.3	97 21.9	25.4	16 49.6	25.6
Mer. Pass.	h m 13 03.4	v 1.8	d 0.7	v 0.5	d 0.6	v 2.1	d 0.1	v 2.6	d 0.0

STARS

Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 39.3	S40 24.1
Achernar	335 47.5	S57 21.4
Acrux	173 39.1	S62 58.4
Adhara	255 33.8	S28 56.8
Aldebaran	291 20.7	N16 27.7
Alioth	166 44.2	N56 04.8
Alkaid	153 20.1	N49 25.4
Al Na'ir	28 18.4	S47 04.3
Alnilam	276 14.0	S 1 13.2
Alphard	218 22.6	S 8 33.8
Alphecca	126 34.0	N26 47.3
Alpheratz	358 12.1	N28 57.9
Altair	62 35.1	N 8 48.4
Ankaa	353 43.0	S42 25.9
Antares	112 59.7	S26 22.8
Arcturus	146 20.4	N19 17.9
Atria	108 26.0	S68 58.9
Avior	234 28.6	S59 26.5
Bellatrix	279 01.2	N 6 19.6
Betelgeuse	271 30.8	N 7 24.0
Canopus	264 08.1	S52 41.4
Capella	281 14.8	N45 58.6
Deneb	49 50.4	N45 11.8
Denebola	183 01.1	N14 41.8
Diphda	349 23.6	S18 06.8
Dubhe	194 24.4	N61 52.3
Elnath	278 47.1	N28 35.3
Eltanin	90 59.0	N51 29.3
Enif	34 14.2	N 9 46.2
Fomalhaut	15 54.4	S29 44.6
Gacrux	172 30.8	S56 59.1
Gienah	176 20.1	S17 25.1
Hadar	149 26.2	S60 15.7
Hamal	328 31.8	N23 21.3
Kaus Aust.	84 20.1	S34 23.6
Kochab	137 18.4	N74 14.7
Markab	14 05.8	N15 04.9
Menkar	314 43.8	N 3 59.9
Menkent	148 39.5	S36 15.5
Miaplacidus	221 44.5	S69 37.7
Mirfak	309 19.6	N49 46.9
Nunki	76 32.3	S26 19.4
Peacock	54 02.6	S56 48.3
Pollux	244 00.8	N28 04.8
Procyon	245 28.1	N 5 16.8
Rasalhague	96 31.8	N12 34.5
Regulus	208 12.2	N12 04.5
Rigel	281 38.3	S 8 13.9
Rigil Kent.	140 28.6	S60 44.3
Sabik	102 43.9	S15 41.8
Schedar	350 12.1	N56 24.8
Shaula	96 59.0	S37 05.1
Sirius	258 57.6	S16 41.4
Spica	158 59.8	S11 02.7
Suhail	223 12.1	S43 20.7
Vega	80 57.6	N38 45.6
Zuben'ubi	137 35.5	S15 56.9

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	341 15.2	14 19
Mars	38 12.7	10 32
Jupiter	307 07.0	16 35
Saturn	226 10.1	21 57

G.M.T.	SUN G.H.A.	SUN Dec.	MOON G.H.A.	v	MOON Dec.	d	H.P.
d h	° ′	° ′	° ′	′	° ′	′	′
5 00	177 05.3	S 6 10.7	7 14.7	10.3	N 5 59.6	10.6	58.4
01	192 05.4	09.8	21 44.0	10.3	5 49.0	10.8	58.4
02	207 05.6	08.8	36 13.3	10.3	5 38.2	10.7	58.5
03	222 05.7	·· 07.8	50 42.6	10.3	5 27.5	10.8	58.5
04	237 05.8	06.9	65 11.9	10.3	5 16.7	10.9	58.5
05	252 06.0	05.9	79 41.2	10.2	5 05.8	10.9	58.6
06	267 06.1	S 6 04.9	94 10.4	10.3	N 4 54.9	10.9	58.6
07	282 06.3	04.0	108 39.7	10.2	4 44.0	11.0	58.6
S 08	297 06.4	03.0	123 08.9	10.3	4 33.0	11.0	58.6
A 09	312 06.6	·· 02.0	137 38.2	10.2	4 22.0	11.0	58.7
T 10	327 06.7	01.1	152 07.4	10.2	4 11.0	11.0	58.7
U 11	342 06.8	6 00.1	166 36.6	10.1	4 00.0	11.1	58.7
R 12	357 07.0	S 5 59.1	181 05.7	10.2	N 3 48.9	11.2	58.7
D 13	12 07.1	58.2	195 34.9	10.2	3 37.7	11.1	58.8
A 14	27 07.3	57.2	210 04.1	10.1	3 26.6	11.2	58.8
Y 15	42 07.4	·· 56.2	224 33.2	10.1	3 15.4	11.2	58.8
16	57 07.6	55.3	239 02.3	10.1	3 04.2	11.3	58.8
17	72 07.7	54.3	253 31.4	10.1	2 52.9	11.2	58.9
18	87 07.8	S 5 53.3	268 00.5	10.1	N 2 41.7	11.3	58.9
19	102 08.0	52.4	282 29.6	10.0	2 30.4	11.3	58.9
20	117 08.1	51.4	296 58.6	10.0	2 19.1	11.3	58.9
21	132 08.3	·· 50.4	311 27.6	10.1	2 07.8	11.4	59.0
22	147 08.4	49.5	325 56.7	10.0	1 56.4	11.4	59.0
23	162 08.6	48.5	340 25.7	9.9	1 45.0	11.4	59.0
6 00	177 08.7	S 5 47.5	354 54.6	10.0	N 1 33.6	11.4	59.0
01	192 08.9	46.6	9 23.6	9.9	1 22.2	11.4	59.0
02	207 09.0	45.6	23 52.5	9.9	1 10.8	11.4	59.1
03	222 09.1	·· 44.6	38 21.4	9.9	0 59.4	11.5	59.1
04	237 09.3	43.7	52 50.3	9.9	0 47.9	11.5	59.1
05	252 09.4	42.7	67 19.2	9.9	0 36.4	11.4	59.1
06	267 09.6	S 5 41.7	81 48.1	9.8	N 0 25.0	11.5	59.2
07	282 09.7	40.8	96 16.9	9.8	0 13.5	11.5	59.2
08	297 09.9	39.8	110 45.7	9.8	N 0 02.0	11.5	59.2
S 09	312 10.0	·· 38.8	125 14.5	9.8	S 0 09.5	11.5	59.2
U 10	327 10.2	37.9	139 43.3	9.7	0 21.0	11.5	59.2
N 11	342 10.3	36.9	154 12.0	9.7	0 32.5	11.6	59.3
D 12	357 10.5	S 5 35.9	168 40.7	9.7	S 0 44.1	11.5	59.3
A 13	12 10.6	34.9	183 09.4	9.7	0 55.6	11.5	59.3
Y 14	27 10.8	34.0	197 38.1	9.7	1 07.1	11.5	59.3
15	42 10.9	·· 33.0	212 06.8	9.6	1 18.6	11.5	59.3
16	57 11.1	32.0	226 35.4	9.6	1 30.1	11.6	59.4
17	72 11.2	31.1	241 04.0	9.5	1 41.7	11.5	59.4
18	87 11.4	S 5 30.1	255 32.5	9.6	S 1 53.2	11.5	59.4
19	102 11.5	29.1	270 01.1	9.5	2 04.7	11.5	59.4
20	117 11.7	28.2	284 29.6	9.5	2 16.2	11.5	59.4
21	132 11.8	·· 27.2	298 58.1	9.5	2 27.7	11.5	59.4
22	147 12.0	26.2	313 26.6	9.4	2 39.2	11.4	59.5
23	162 12.1	25.2	327 55.0	9.4	2 50.6	11.5	59.5
7 00	177 12.3	S 5 24.3	342 23.4	9.4	S 3 02.1	11.5	59.5
01	192 12.4	23.3	356 51.8	9.3	3 13.6	11.4	59.5
02	207 12.6	22.3	11 20.1	9.4	3 25.0	11.4	59.5
03	222 12.7	·· 21.4	25 48.5	9.3	3 36.4	11.4	59.5
04	237 12.9	20.4	40 16.8	9.2	3 47.8	11.4	59.5
05	252 13.0	19.4	54 45.0	9.3	3 59.2	11.4	59.6
06	267 13.2	S 5 18.4	69 13.3	9.2	S 4 10.6	11.3	59.6
07	282 13.3	17.5	83 41.5	9.1	4 21.9	11.4	59.6
08	297 13.5	16.5	98 09.6	9.2	4 33.3	11.3	59.6
M 09	312 13.6	·· 15.5	112 37.8	9.1	4 44.6	11.2	59.6
O 10	327 13.8	14.6	127 05.9	9.1	4 55.8	11.3	59.6
N 11	342 13.9	13.6	141 34.0	9.0	5 07.1	11.2	59.6
D 12	357 14.1	S 5 12.6	156 02.0	9.0	S 5 18.3	11.2	59.6
A 13	12 14.2	11.6	170 30.0	9.0	5 29.5	11.2	59.7
Y 14	27 14.4	10.7	184 58.0	9.0	5 40.7	11.1	59.7
15	42 14.5	·· 09.7	199 26.0	8.9	5 51.8	11.1	59.7
16	57 14.7	08.7	213 53.9	8.9	6 02.9	11.1	59.7
17	72 14.8	07.8	228 21.8	8.8	6 14.0	11.0	59.7
18	87 15.0	S 5 06.8	242 49.6	8.8	S 6 25.0	11.0	59.7
19	102 15.1	05.8	257 17.4	8.8	6 36.0	11.0	59.7
20	117 15.3	04.8	271 45.2	8.8	6 47.0	10.9	59.7
21	132 15.4	·· 03.9	286 13.0	8.7	6 57.9	10.9	59.7
22	147 15.6	02.9	300 40.7	8.6	7 08.8	10.9	59.7
23	162 15.7	01.9	315 08.3	8.7	7 19.7	10.8	59.8
	S.D. 16.1	d 1.0	S.D. 16.0		16.2		16.3

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 5	Moonrise 6	Moonrise 7	Moonrise 8
°	h m	h m	h m	h m	h m	h m	h m
N 72	04 45	06 04	07 11	17 35	19 30	21 28	23 30
N 70	04 53	06 04	07 05	17 39	19 26	21 17	23 09
68	04 59	06 04	06 59	17 42	19 24	21 08	22 53
66	05 04	06 04	06 55	17 44	19 22	21 01	22 40
64	05 08	06 03	06 51	17 46	19 20	20 54	22 29
62	05 12	06 03	06 47	17 48	19 18	20 49	22 20
60	05 15	06 03	06 44	17 50	19 17	20 44	22 12
N 58	05 17	06 03	06 42	17 51	19 15	20 40	22 05
56	05 19	06 02	06 39	17 53	19 14	20 37	21 59
54	05 21	06 02	06 37	17 54	19 13	20 34	21 54
52	05 23	06 02	06 35	17 55	19 12	20 31	21 49
50	05 24	06 01	06 33	17 56	19 11	20 28	21 45
45	05 26	06 00	06 29	17 58	19 10	20 22	21 35
N 40	05 28	05 59	06 26	18 00	19 08	20 18	21 27
35	05 29	05 58	06 23	18 01	19 07	20 13	21 21
30	05 29	05 57	06 21	18 03	19 06	20 10	21 15
20	05 28	05 54	06 16	18 05	19 04	20 04	21 05
N 10	05 26	05 51	06 12	18 07	19 02	19 58	20 56
0	05 23	05 47	06 08	18 09	19 01	19 53	20 48
S 10	05 18	05 43	06 04	18 11	18 59	19 48	20 39
20	05 11	05 37	05 59	18 13	18 57	19 43	20 31
30	05 02	05 30	05 54	18 15	18 56	19 37	20 21
35	04 55	05 26	05 51	18 17	18 55	19 34	20 15
40	04 48	05 20	05 48	18 18	18 54	19 30	20 09
45	04 38	05 14	05 44	18 20	18 52	19 26	20 02
S 50	04 26	05 06	05 39	18 22	18 51	19 21	19 53
52	04 20	05 02	05 37	18 23	18 50	19 18	19 49
54	04 13	04 58	05 34	18 24	18 49	19 16	19 44
56	04 05	04 53	05 31	18 25	18 49	19 13	19 40
58	03 57	04 47	05 28	18 27	18 48	19 10	19 34
S 60	03 46	04 41	05 25	18 28	18 47	19 06	19 28

Lat.	Sunset	Twilight Civil	Twilight Naut.	Moonset 5	Moonset 6	Moonset 7	Moonset 8
°	h m	h m	h m	h m	h m	h m	h m
N 72	17 13	18 21	19 41	06 43	06 36	06 29	06 22
N 70	17 20	18 21	19 33	06 36	06 36	06 35	06 35
68	17 25	18 21	19 26	06 31	06 35	06 40	06 45
66	17 30	18 21	19 21	06 27	06 35	06 44	06 54
64	17 33	18 21	19 16	06 23	06 35	06 48	07 02
62	17 37	18 21	19 13	06 20	06 35	06 51	07 08
60	17 40	18 21	19 09	06 17	06 35	06 53	07 14
N 58	17 42	18 21	19 07	06 14	06 35	06 56	07 19
56	17 44	18 22	19 05	06 12	06 35	06 58	07 23
54	17 46	18 22	19 03	06 10	06 35	07 00	07 27
52	17 48	18 22	19 01	06 08	06 35	07 02	07 31
50	17 50	18 22	19 00	06 06	06 35	07 03	07 34
45	17 54	18 23	18 57	06 02	06 34	07 07	07 41
N 40	17 57	18 24	18 56	05 59	06 34	07 10	07 48
35	18 00	18 25	18 55	05 56	06 34	07 13	07 53
30	18 02	18 26	18 54	05 54	06 34	07 15	07 57
20	18 07	18 29	18 54	05 50	06 34	07 19	08 05
N 10	18 11	18 32	18 56	05 46	06 34	07 22	08 12
0	18 15	18 35	18 59	05 42	06 33	07 26	08 19
S 10	18 19	18 40	19 04	05 38	06 33	07 29	08 26
20	18 23	18 45	19 11	05 35	06 33	07 32	08 33
30	18 28	18 52	19 20	05 30	06 33	07 36	08 41
35	18 31	18 56	19 26	05 27	06 32	07 38	08 45
40	18 34	19 02	19 34	05 24	06 32	07 41	08 51
45	18 38	19 08	19 43	05 21	06 32	07 44	08 57
S 50	18 43	19 16	19 55	05 17	06 31	07 48	09 04
52	18 45	19 19	20 01	05 15	06 31	07 49	09 08
54	18 47	19 24	20 08	05 13	06 31	07 51	09 12
56	18 50	19 28	20 15	05 10	06 31	07 53	09 16
58	18 53	19 34	20 24	05 08	06 31	07 55	09 20
S 60	18 56	19 40	20 34	05 05	06 30	07 58	09 26

Day	SUN Eqn. of Time 00ʰ	SUN Eqn. of Time 12ʰ	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
	m s	m s	h m	h m	h m	d	
5	11 39	11 32	12 12	24 21	11 55	15	○
6	11 25	11 18	12 11	00 21	12 47	16	
7	11 11	11 04	12 11	01 13	13 39	17	

1977 MARCH 8, 9, 10 (TUES., WED., THURS.)

G.M.T.		ARIES	VENUS −4.3		MARS +1.4		JUPITER −1.8		SATURN +0.2	
d	h	G.H.A. ° ′	G.H.A. ° ′	Dec. ° ′	G.H.A. ° ′	Dec. ° ′	G.H.A. ° ′	Dec. ° ′	G.H.A. ° ′	Dec. ° ′
8	00	165 35.1	146 19.3	N14 37.6	202 15.3	S15 41.7	112 24.0	N18 25.5	31 52.3	N18 25.6
	01	180 37.5	161 21.2	38.3	217 15.9	41.1	127 26.1	25.6	46 54.9	25.7
	02	195 40.0	176 23.1	38.9	232 16.4	40.5	142 28.2	25.7	61 57.5	25.7
	03	210 42.5	191 25.0	·· 39.5	247 17.0	·· 39.9	157 30.3	·· 25.8	77 00.1	·· 25.7
	04	225 44.9	206 26.9	40.1	262 17.5	39.3	172 32.4	25.9	92 02.7	25.8
	05	240 47.4	221 28.8	40.8	277 18.1	38.7	187 34.4	25.9	107 05.3	25.8
	06	255 49.9	236 30.7	N14 41.4	292 18.6	S15 38.1	202 36.5	N18 26.0	122 07.9	N18 25.9
	07	270 52.3	251 32.7	42.0	307 19.2	37.5	217 38.6	26.1	137 10.5	25.9
T	08	285 54.8	266 34.6	42.6	322 19.7	36.8	232 40.7	26.2	152 13.1	25.9
U	09	300 57.2	281 36.5	·· 43.2	337 20.2	·· 36.2	247 42.8	·· 26.3	167 15.7	·· 26.0
E	10	315 59.7	296 38.4	43.8	352 20.8	35.6	262 44.8	26.4	182 18.3	26.0
S	11	331 02.2	311 40.4	44.5	7 21.3	35.0	277 46.9	26.5	197 20.9	26.1
D	12	346 04.6	326 42.3	N14 45.1	22 21.9	S15 34.4	292 49.0	N18 26.6	212 23.6	N18 26.1
A	13	1 07.1	341 44.2	45.7	37 22.4	33.8	307 51.1	26.7	227 26.2	26.1
Y	14	16 09.6	356 46.2	46.3	52 23.0	33.2	322 53.2	26.8	242 28.8	26.2
	15	31 12.0	11 48.1	·· 46.9	67 23.5	·· 32.6	337 55.2	·· 26.9	257 31.4	·· 26.2
	16	46 14.5	26 50.0	47.5	82 24.1	31.9	352 57.3	27.0	272 34.0	26.3
	17	61 17.0	41 52.0	48.1	97 24.6	31.3	7 59.4	27.1	287 36.6	26.3
	18	76 19.4	56 53.9	N14 48.7	112 25.1	S15 30.7	23 01.5	N18 27.2	302 39.2	N18 26.3
	19	91 21.9	71 55.9	49.3	127 25.7	30.1	38 03.6	27.3	317 41.8	26.4
	20	106 24.4	86 57.9	49.9	142 26.2	29.5	53 05.6	27.4	332 44.4	26.4
	21	121 26.8	101 59.8	·· 50.5	157 26.8	·· 28.9	68 07.7	·· 27.5	347 47.0	·· 26.5
	22	136 29.3	117 01.8	51.1	172 27.3	28.2	83 09.8	27.6	2 49.6	26.5
	23	151 31.7	132 03.7	51.7	187 27.9	27.6	98 11.9	27.7	17 52.2	26.5
9	00	166 34.2	147 05.7	N14 52.3	202 28.4	S15 27.0	113 14.0	N18 27.8	32 54.8	N18 26.6
	01	181 36.7	162 07.7	52.9	217 29.0	26.4	128 16.0	27.9	47 57.4	26.6
	02	196 39.1	177 09.7	53.5	232 29.5	25.8	143 18.1	28.0	63 00.0	26.7
	03	211 41.6	192 11.6	·· 54.0	247 30.1	·· 25.2	158 20.2	·· 28.1	78 02.6	·· 26.7
	04	226 44.1	207 13.6	54.6	262 30.6	24.5	173 22.3	28.2	93 05.2	26.7
	05	241 46.5	222 15.6	55.2	277 31.2	23.9	188 24.3	28.3	108 07.8	26.8
	06	256 49.0	237 17.6	N14 55.8	292 31.7	S15 23.3	203 26.4	N18 28.4	123 10.5	N18 26.8
W	07	271 51.5	252 19.6	56.4	307 32.3	22.7	218 28.5	28.5	138 13.1	26.9
E	08	286 53.9	267 21.6	57.0	322 32.8	22.1	233 30.6	28.6	153 15.7	26.9
D	09	301 56.4	282 23.6	·· 57.5	337 33.3	·· 21.5	248 32.6	·· 28.7	168 18.3	·· 26.9
N	10	316 58.9	297 25.6	58.1	352 33.9	20.8	263 34.7	28.8	183 20.9	27.0
E	11	332 01.3	312 27.6	58.7	7 34.4	20.2	278 36.8	28.9	198 23.5	27.0
S	12	347 03.8	327 29.6	N14 59.3	22 35.0	S15 19.6	293 38.9	N18 29.0	213 26.1	N18 27.0
D	13	2 06.2	342 31.6	14 59.8	37 35.5	19.0	308 40.9	29.1	228 28.7	27.1
A	14	17 08.7	357 33.6	15 00.4	52 36.1	18.4	323 43.0	29.2	243 31.3	27.1
Y	15	32 11.2	12 35.7	·· 01.0	67 36.6	·· 17.7	338 45.1	·· 29.3	258 33.9	·· 27.2
	16	47 13.6	27 37.7	01.6	82 37.2	17.1	353 47.2	29.4	273 36.5	27.2
	17	62 16.1	42 39.7	02.1	97 37.7	16.5	8 49.2	29.5	288 39.1	27.2
	18	77 18.6	57 41.7	N15 02.7	112 38.3	S15 15.9	23 51.3	N18 29.6	303 41.7	N18 27.3
	19	92 21.0	72 43.8	03.2	127 38.8	15.3	38 53.4	29.7	318 44.3	27.3
	20	107 23.5	87 45.8	03.8	142 39.4	14.6	53 55.5	29.8	333 46.9	27.4
	21	122 26.0	102 47.9	·· 04.4	157 39.9	·· 14.0	68 57.5	·· 29.9	348 49.5	·· 27.4
	22	137 28.4	117 49.9	04.9	172 40.5	13.4	83 59.6	30.0	3 52.1	27.4
	23	152 30.9	132 51.9	05.5	187 41.0	12.8	99 01.7	30.1	18 54.7	27.5
10	00	167 33.3	147 54.0	N15 06.0	202 41.6	S15 12.1	114 03.7	N18 30.2	33 57.3	N18 27.5
	01	182 35.8	162 56.0	06.6	217 42.1	11.5	129 05.8	30.3	48 59.9	27.5
	02	197 38.3	177 58.1	07.1	232 42.7	10.9	144 07.9	30.4	64 02.5	27.6
	03	212 40.7	193 00.2	·· 07.7	247 43.2	·· 10.3	159 10.0	·· 30.5	79 05.1	·· 27.6
	04	227 43.2	208 02.2	08.2	262 43.8	09.7	174 12.0	30.6	94 07.7	27.7
	05	242 45.7	223 04.3	08.8	277 44.3	09.0	189 14.1	30.7	109 10.3	27.7
	06	257 48.1	238 06.4	N15 09.3	292 44.9	S15 08.4	204 16.2	N18 30.8	124 12.9	N18 27.7
	07	272 50.6	253 08.4	09.9	307 45.5	07.8	219 18.2	30.9	139 15.5	27.8
T	08	287 53.1	268 10.5	10.4	322 46.0	07.2	234 20.3	31.0	154 18.1	27.8
H	09	302 55.5	283 12.6	·· 11.0	337 46.6	·· 06.5	249 22.4	·· 31.1	169 20.7	·· 27.9
U	10	317 58.0	298 14.7	11.5	352 47.1	05.9	264 24.4	31.2	184 23.3	27.9
R	11	333 00.5	313 16.8	12.0	7 47.7	05.3	279 26.5	31.3	199 25.9	27.9
S	12	348 02.9	328 18.9	N15 12.6	22 48.2	S15 04.6	294 28.6	N18 31.4	214 28.5	N18 28.0
D	13	3 05.4	343 21.0	13.1	37 48.8	04.0	309 30.7	31.5	229 31.1	28.0
A	14	18 07.8	358 23.1	13.6	52 49.3	03.4	324 32.7	31.6	244 33.7	28.0
Y	15	33 10.3	13 25.2	·· 14.2	67 49.9	·· 02.8	339 34.8	·· 31.7	259 36.3	·· 28.1
	16	48 12.8	28 27.3	14.7	82 50.4	02.1	354 36.9	31.8	274 38.9	28.1
	17	63 15.2	43 29.4	15.2	97 51.0	01.5	9 38.9	31.9	289 41.5	28.2
	18	78 17.7	58 31.5	N15 15.7	112 51.5	S15 00.9	24 41.0	N18 32.0	304 44.1	N18 28.2
	19	93 20.2	73 33.6	16.3	127 52.1	15 00.3	39 43.1	32.1	319 46.7	28.2
	20	108 22.6	88 35.7	16.8	142 52.6	14 59.6	54 45.1	32.2	334 49.3	28.3
	21	123 25.1	103 37.8	·· 17.3	157 53.2	·· 59.0	69 47.2	·· 32.3	349 51.9	·· 28.3
	22	138 27.6	118 40.0	17.8	172 53.7	58.4	84 49.3	32.4	4 54.5	28.3
	23	153 30.0	133 42.1	18.3	187 54.3	57.7	99 51.3	32.5	19 57.1	28.4
Mer. Pass.		h m 12 51.6	v 2.0	d 0.6	v 0.5	d 0.6	v 2.1	d 0.1	v 2.6	d 0.0

STARS		
Name	S.H.A. ° ′	Dec. ° ′
Acamar	315 39.3	S40 24.1
Achernar	335 47.6	S57 21.4
Acrux	173 39.1	S62 58.4
Adhara	255 33.8	S28 56.8
Aldebaran	291 20.8	N16 27.7
Alioth	166 44.1	N56 04.8
Alkaid	153 20.0	N49 25.4
Al Na'ir	28 18.4	S47 04.2
Alnilam	276 14.0	S 1 13.2
Alphard	218 22.6	S 8 33.8
Alphecca	126 34.0	N26 47.3
Alpheratz	358 12.1	N28 57.8
Altair	62 35.0	N 8 48.4
Ankaa	353 43.0	S42 25.9
Antares	112 59.7	S26 22.8
Arcturus	146 20.4	N19 17.9
Atria	108 26.0	S68 58.9
Avior	234 28.7	S59 26.5
Bellatrix	279 01.3	N 6 19.6
Betelgeuse	271 30.8	N 7 24.0
Canopus	264 08.1	S52 41.4
Capella	281 14.8	N45 58.6
Deneb	49 50.4	N45 11.8
Denebola	83 01.1	N14 41.8
Diphda	349 23.6	S18 06.8
Dubhe	194 24.4	N61 52.3
Elnath	278 47.1	N28 35.3
Eltanin	90 58.9	N51 29.3
Enif	34 14.2	N 9 46.2
Fomalhaut	15 54.4	S29 44.6
Gacrux	172 30.8	S56 59.2
Gienah	176 20.1	S17 25.1
Hadar	149 26.2	S60 15.7
Hamal	328 31.8	N23 21.3
Kaus Aust.	84 20.1	S34 23.6
Kochab	137 18.3	N74 14.7
Markab	14 05.8	N15 04.9
Menkar	314 43.8	N 3 59.9
Menkent	148 39.5	S36 15.5
Miaplacidus	221 44.6	S69 37.7
Mirfak	309 19.7	N49 46.9
Nunki	76 32.3	S26 19.4
Peacock	54 02.6	S56 48.3
Pollux	244 00.8	N28 04.8
Procyon	245 28.1	N 5 16.8
Rasalhague	96 31.8	N12 34.5
Regulus	208 12.2	N12 04.5
Rigel	281 38.3	S 8 13.9
Rigil Kent.	140 28.6	S60 44.3
Sabik	102 43.8	S15 41.8
Schedar	350 12.2	N56 24.8
Shaula	96 59.0	S37 05.1
Sirius	258 57.7	S16 41.4
Spica	158 59.8	S11 02.7
Suhail	223 12.1	S43 20.7
Vega	80 57.6	N38 45.5
Zuben'ubi	137 35.5	S15 56.9

	S.H.A. ° ′	Mer. Pass. h m
Venus	340 31.5	14 10
Mars	35 54.2	10 30
Jupiter	306 39.7	16 25
Saturn	226 20.6	21 45

	G.M.T.	SUN		MOON				
		G.H.A.	Dec.	G.H.A.	*v*	Dec.	*d*	H.P.
	d h	° ′	° ′	° ′	′	° ′	′	′
	8 00	177 15.9	S 5 00.9	329 36.0	8.6	S 7 30.5	10.7	59.8
	01	192 16.0	5 00.0	344 03.6	8.6	7 41.2	10.7	59.8
	02	207 16.2	4 59.0	358 31.2	8.5	7 51.9	10.7	59.8
	03	222 16.4	·· 58.0	12 58.7	8.5	8 02.6	10.6	59.8
	04	237 16.5	57.0	27 26.2	8.5	8 13.2	10.6	59.8
	05	252 16.7	56.1	41 53.7	8.4	8 23.8	10.5	59.8
	06	267 16.8	S 4 55.1	56 21.1	8.4	S 8 34.3	10.5	59.8
	07	282 17.0	54.1	70 48.5	8.3	8 44.8	10.4	59.8
	08	297 17.1	53.1	85 15.8	8.4	8 55.2	10.3	59.8
T	09	312 17.3	·· 52.2	99 43.2	8.2	9 05.5	10.3	59.8
U	10	327 17.4	51.2	114 10.4	8.3	9 15.8	10.3	59.8
E	11	342 17.6	50.2	128 37.7	8.2	9 26.1	10.2	59.8
S	12	357 17.7	S 4 49.2	143 04.9	8.2	S 9 36.3	10.1	59.8
D	13	12 17.9	48.3	157 32.1	8.1	9 46.4	10.1	59.8
A	14	27 18.1	47.3	171 59.2	8.1	9 56.5	10.0	59.8
Y	15	42 18.2	·· 46.3	186 26.3	8.1	10 06.5	9.9	59.8
	16	57 18.4	45.3	200 53.4	8.0	10 16.4	9.9	59.8
	17	72 18.5	44.4	215 20.4	8.0	10 26.3	9.8	59.8
	18	87 18.7	S 4 43.4	229 47.4	7.9	S10 36.1	9.8	59.8
	19	102 18.8	42.4	244 14.3	7.9	10 45.9	9.6	59.8
	20	117 19.0	41.4	258 41.2	7.9	10 55.5	9.6	59.8
	21	132 19.1	·· 40.5	273 08.1	7.9	11 05.1	9.6	59.8
	22	147 19.3	39.5	287 35.0	7.8	11 14.7	9.5	59.8
	23	162 19.5	38.5	302 01.8	7.7	11 24.2	9.3	59.8
	9 00	177 19.6	S 4 37.5	316 28.5	7.7	S11 33.5	9.4	59.8
	01	192 19.8	36.6	330 55.2	7.7	11 42.9	9.2	59.8
	02	207 19.9	35.6	345 21.9	7.7	11 52.1	9.2	59.8
	03	222 20.1	·· 34.6	359 48.6	7.6	12 01.3	9.1	59.8
	04	237 20.2	33.6	14 15.2	7.6	12 10.4	9.0	59.8
	05	252 20.4	32.7	28 41.8	7.5	12 19.4	8.9	59.8
	06	267 20.6	S 4 31.7	43 08.3	7.5	S12 28.3	8.9	59.8
W	07	282 20.7	30.7	57 34.8	7.5	12 37.2	8.8	59.8
E	08	297 20.9	29.7	72 01.3	7.5	12 46.0	8.6	59.8
D	09	312 21.0	·· 28.7	86 27.8	7.4	12 54.6	8.6	59.8
N	10	327 21.2	27.8	100 54.2	7.3	13 03.2	8.6	59.8
E	11	342 21.4	26.8	115 20.5	7.4	13 11.8	8.4	59.8
S	12	357 21.5	S 4 25.8	129 46.9	7.3	S13 20.2	8.4	59.8
D	13	12 21.7	24.8	144 13.2	7.2	13 28.6	8.2	59.8
A	14	27 21.8	23.9	158 39.4	7.2	13 36.8	8.2	59.8
Y	15	42 22.0	·· 22.9	173 05.6	7.2	13 45.0	8.1	59.8
	16	57 22.2	21.9	187 31.8	7.2	13 53.1	7.9	59.8
	17	72 22.3	20.9	201 58.0	7.1	14 01.0	7.9	59.8
	18	87 22.5	S 4 19.9	216 24.1	7.1	S14 08.9	7.8	59.8
	19	102 22.6	19.0	230 50.2	7.1	14 16.7	7.8	59.8
	20	117 22.8	18.0	245 16.3	7.0	14 24.5	7.6	59.8
	21	132 23.0	·· 17.0	259 42.3	7.0	14 32.1	7.5	59.8
	22	147 23.1	16.0	274 08.3	7.0	14 39.6	7.4	59.8
	23	162 23.3	15.1	288 34.3	6.9	14 47.0	7.3	59.8
	10 00	177 23.4	S 4 14.1	303 00.2	6.9	S14 54.3	7.3	59.8
	01	192 23.6	13.1	317 26.1	6.9	15 01.6	7.1	59.7
	02	207 23.8	12.1	331 52.0	6.9	15 08.7	7.0	59.7
	03	222 23.9	·· 11.1	346 17.9	6.8	15 15.7	6.9	59.7
	04	237 24.1	10.2	0 43.7	6.8	15 22.6	6.8	59.7
	05	252 24.2	09.2	15 09.5	6.7	15 29.4	6.8	59.7
	06	267 24.4	S 4 08.2	29 35.2	6.8	S15 36.2	6.6	59.7
	07	282 24.6	07.2	44 01.0	6.7	15 42.8	6.5	59.7
T	08	297 24.7	06.2	58 26.7	6.7	15 49.3	6.4	59.7
H	09	312 24.9	·· 05.3	72 52.4	6.6	15 55.7	6.3	59.7
U	10	327 25.0	04.3	87 18.0	6.6	16 02.0	6.2	59.7
R	11	342 25.2	03.3	101 43.6	6.6	16 08.2	6.0	59.7
S	12	357 25.4	S 4 02.3	116 09.2	6.6	S16 14.2	6.0	59.7
D	13	12 25.5	01.3	130 34.8	6.6	16 20.2	5.9	59.6
A	14	27 25.7	4 00.4	145 00.4	6.5	16 26.1	5.7	59.6
Y	15	42 25.9	3 59.4	159 25.9	6.6	16 31.8	5.7	59.6
	16	57 26.0	58.4	173 51.5	6.4	16 37.5	5.5	59.6
	17	72 26.2	57.4	188 16.9	6.5	16 43.0	5.4	59.6
	18	87 26.3	S 3 56.4	202 42.4	6.5	S16 48.4	5.3	59.6
	19	102 26.5	55.5	217 07.9	6.4	16 53.7	5.2	59.6
	20	117 26.7	54.5	231 33.3	6.4	16 58.9	5.1	59.6
	21	132 26.8	·· 53.5	245 58.7	6.4	17 04.0	5.0	59.6
	22	147 27.0	52.5	260 24.1	6.4	17 09.0	4.8	59.5
	23	162 27.2	51.5	274 49.5	6.4	17 13.8	4.7	59.5
		S.D. 16.1	*d* 1.0	S.D. 16.3		16.3		16.3

Lat.	Twilight		Sunrise	Moonrise			
	Naut.	Civil		8	9	10	11
°	h m	h m	h m	h m	h m	h m	h m
N 72	04 29	05 49	06 56	23 30	25 40	01 40	04 16
N 70	04 39	05 50	06 51	23 09	25 03	01 03	02 54
68	04 46	05 51	06 47	22 53	24 38	00 38	02 16
66	04 53	05 52	06 43	22 40	24 18	00 18	01 49
64	04 58	05 53	06 40	22 29	24 02	00 02	01 29
62	05 02	05 54	06 38	22 20	23 49	25 12	01 12
60	05 06	05 54	06 35	22 12	23 38	24 58	00 58
N 58	05 09	05 54	06 33	22 05	23 29	24 46	00 46
56	05 11	05 55	06 32	21 59	23 20	24 36	00 36
54	05 14	05 55	06 30	21 54	23 13	24 27	00 27
52	05 16	05 55	06 28	21 49	23 06	24 19	00 19
50	05 17	05 55	06 27	21 45	23 00	24 12	00 12
45	05 21	05 55	06 24	21 35	22 47	23 56	25 01
N 40	05 23	05 54	06 21	21 27	22 37	23 44	24 47
35	05 25	05 54	06 19	21 21	22 28	23 33	24 35
30	05 26	05 53	06 17	21 15	22 20	23 24	24 25
20	05 26	05 52	06 14	21 05	22 06	23 08	24 08
N 10	05 25	05 49	06 10	20 56	21 54	22 54	23 53
0	05 22	05 47	06 07	20 48	21 43	22 41	23 38
S 10	05 18	05 43	06 04	20 39	21 33	22 28	23 24
20	05 13	05 38	06 00	20 31	21 21	22 14	23 09
30	05 04	05 32	05 56	20 21	21 08	21 58	22 52
35	04 58	05 28	05 54	20 15	21 00	21 49	22 42
40	04 51	05 24	05 51	20 09	20 52	21 39	22 31
45	04 43	05 18	05 48	20 02	20 42	21 26	22 17
S 50	04 31	05 11	05 44	19 53	20 29	21 12	22 01
52	04 26	05 08	05 42	19 49	20 24	21 05	21 53
54	04 20	05 04	05 40	19 44	20 18	20 57	21 45
56	04 13	05 00	05 38	19 40	20 11	20 49	21 35
58	04 05	04 55	05 35	19 34	20 03	20 39	21 24
S 60	03 56	04 49	05 32	19 28	19 55	20 28	21 12

Lat.	Sunset	Twilight		Moonset			
		Civil	Naut.	8	9	10	11
°	h m	h m	h m	h m	h m	h m	h m
N 72	17 28	18 35	19 56	06 22	06 13	06 00	05 25
N 70	17 32	18 33	19 46	06 35	06 35	06 38	06 47
68	17 36	18 32	19 37	06 45	06 53	07 05	07 26
66	17 40	18 31	19 31	06 54	07 07	07 25	07 53
64	17 42	18 30	19 25	07 02	07 19	07 42	08 14
62	17 45	18 29	19 21	07 08	07 29	07 56	08 31
60	17 47	18 29	19 17	07 14	07 38	08 07	08 45
N 58	17 49	18 28	19 14	07 19	07 45	08 17	08 58
56	17 51	18 28	19 11	07 23	07 52	08 26	09 08
54	17 52	18 28	19 09	07 27	07 58	08 34	09 17
52	17 54	18 27	19 07	07 31	08 03	08 41	09 26
50	17 55	18 27	19 05	07 34	08 08	08 48	09 33
45	17 58	18 27	19 01	07 41	08 19	09 01	09 49
N 40	18 00	18 27	18 59	07 48	08 28	09 13	10 02
35	18 02	18 28	18 57	07 53	08 36	09 22	10 13
30	18 04	18 28	18 56	07 57	08 42	09 31	10 23
20	18 08	18 30	18 55	08 05	08 54	09 46	10 40
N 10	18 11	18 32	18 56	08 12	09 04	09 58	10 54
0	18 14	18 35	18 59	08 19	09 14	10 11	11 08
S 10	18 17	18 38	19 03	08 26	09 24	10 23	11 22
20	18 20	18 42	19 08	08 33	09 34	10 36	11 36
30	18 24	18 48	19 17	08 41	09 46	10 50	11 53
35	18 27	18 52	19 22	08 45	09 53	10 59	12 03
40	18 29	18 57	19 29	08 51	10 00	11 09	12 14
45	18 33	19 02	19 37	08 57	10 10	11 20	12 27
S 50	18 36	19 09	19 48	09 04	10 21	11 34	12 43
52	18 38	19 12	19 54	09 08	10 26	11 41	12 51
54	18 40	19 16	20 00	09 12	10 31	11 48	12 59
56	18 42	19 20	20 06	09 16	10 38	11 56	13 09
58	18 45	19 25	20 14	09 20	10 45	12 05	13 19
S 60	18 47	19 30	20 23	09 26	10 53	12 16	13 31

Day	SUN			MOON			
	Eqn. of Time		Mer. Pass.	Mer. Pass.		Age	Phase
	00ʰ	12ʰ		Upper	Lower		
	m s	m s	h m	h m	h m	d	
8	10 57	10 49	12 11	02 06	14 33	18	◑
9	10 42	10 34	12 11	03 01	15 29	19	
10	10 27	10 19	12 10	03 57	16 26	20	

1977 MARCH 11, 12, 13 (FRI., SAT., SUN.)

	G.M.T.	ARIES	VENUS −4.2		MARS +1.4		JUPITER −1.8		SATURN +0.2		STARS		
		G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	Name	S.H.A.	Dec.
	d h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	° ′
	11 00	168 32.5	148 44.2	N15 18.9	202 54.9	S14 57.1	114 53.4	N18 32.6	34 59.7	N18 28.4	Acamar	315 39.3	S40 24.0
	01	183 35.0	163 46.4	19.4	217 55.4	56.5	129 55.5	32.7	50 02.3	28.5	Achernar	335 47.6	S57 21.4
	02	198 37.4	178 48.5	19.9	232 56.0	55.9	144 57.5	32.8	65 04.9	28.5	Acrux	173 39.1	S62 58.4
	03	213 39.9	193 50.6	·· 20.4	247 56.5	·· 55.2	159 59.6	·· 32.9	80 07.5	·· 28.5	Adhara	255 33.8	S28 56.8
	04	228 42.3	208 52.8	20.9	262 57.1	54.6	175 01.7	33.0	95 10.1	28.6	Aldebaran	291 20.8	N16 27.7
	05	243 44.8	223 54.9	21.4	277 57.6	54.0	190 03.7	33.1	110 12.7	28.6			
	06	258 47.3	238 57.1	N15 21.9	292 58.2	S14 53.3	205 05.8	N18 33.2	125 15.3	N18 28.6	Alioth	166 44.1	N56 04.8
	07	273 49.7	253 59.2	22.4	307 58.7	52.7	220 07.9	33.3	140 17.9	28.7	Alkaid	153 20.0	N49 25.4
	08	288 52.2	269 01.4	22.9	322 59.3	52.1	235 09.9	33.4	155 20.5	28.7	Al Na'ir	28 18.4	S47 04.2
F	09	303 54.7	284 03.6	·· 23.4	337 59.9	·· 51.4	250 12.0	·· 33.5	170 23.1	·· 28.7	Alnilam	276 14.0	S 1 13.2
R	10	318 57.1	299 05.7	23.9	353 00.4	50.8	265 14.1	33.6	185 25.7	28.8	Alphard	218 22.6	S 8 33.8
I	11	333 59.6	314 07.9	24.4	8 01.0	50.2	280 16.1	33.7	200 28.3	28.8			
D	12	349 02.1	329 10.1	N15 24.9	23 01.5	S14 49.5	295 18.2	N18 33.8	215 30.9	N18 28.9	Alphecca	126 34.0	N26 47.3
A	13	4 04.5	344 12.3	25.4	38 02.1	48.9	310 20.2	33.9	230 33.5	28.9	Alpheratz	358 12.1	N28 57.8
Y	14	19 07.0	359 14.4	25.9	53 02.6	48.3	325 22.3	34.0	245 36.1	28.9	Altair	62 35.0	N 8 48.4
	15	34 09.5	14 16.6	·· 26.4	68 03.2	·· 47.7	340 24.4	·· 34.1	260 38.7	·· 29.0	Ankaa	353 43.0	S42 25.9
	16	49 11.9	29 18.8	26.9	83 03.8	47.0	355 26.4	34.2	275 41.3	29.0	Antares	112 59.7	S26 22.8
	17	64 14.4	44 21.0	27.4	98 04.3	46.4	10 28.5	34.3	290 43.8	29.0			
	18	79 16.8	59 23.2	N15 27.8	113 04.9	S14 45.8	25 30.6	N18 34.4	305 46.4	N18 29.1	Arcturus	146 20.4	N19 17.9
	19	94 19.3	74 25.4	28.3	128 05.4	45.1	40 32.6	34.5	320 49.0	29.1	Atria	108 25.9	S68 58.9
	20	109 21.8	89 27.6	28.8	143 06.0	44.5	55 34.7	34.6	335 51.6	29.1	Avior	234 28.7	S59 26.5
	21	124 24.2	104 29.8	·· 29.3	158 06.5	·· 43.8	70 36.7	·· 34.7	350 54.2	·· 29.2	Bellatrix	279 01.3	N 6 19.6
	22	139 26.7	119 32.0	29.8	173 07.1	43.2	85 38.8	34.8	5 56.8	29.2	Betelgeuse	271 30.8	N 7 24.0
	23	154 29.2	134 34.2	30.2	188 07.7	42.6	100 40.9	34.9	20 59.4	29.3			
	12 00	169 31.6	149 36.5	N15 30.7	203 08.2	S14 41.9	115 42.9	N18 35.0	36 02.0	N18 29.3	Canopus	264 08.1	S52 41.4
	01	184 34.1	164 38.7	31.2	218 08.8	41.3	130 45.0	35.1	51 04.6	29.3	Capella	281 14.8	N45 58.6
	02	199 36.6	179 40.9	31.7	233 09.3	40.7	145 47.1	35.2	66 07.2	29.4	Deneb	49 50.4	N45 11.8
	03	214 39.0	194 43.1	·· 32.1	248 09.9	·· 40.0	160 49.1	·· 35.3	81 09.8	·· 29.4	Denebola	183 01.1	N14 41.8
	04	229 41.5	209 45.4	32.6	263 10.5	39.4	175 51.2	35.4	96 12.4	29.4	Diphda	349 23.6	S18 06.8
	05	244 43.9	224 47.6	33.1	278 11.0	38.8	190 53.2	35.5	111 15.0	29.5			
	06	259 46.4	239 49.8	N15 33.5	293 11.6	S14 38.1	205 55.3	N18 35.6	126 17.6	N18 29.5	Dubhe	194 24.4	N61 52.3
	07	274 48.9	254 52.1	34.0	308 12.1	37.5	220 57.4	35.7	141 20.2	29.5	Elnath	278 47.1	N28 35.3
S	08	289 51.3	269 54.3	34.4	323 12.7	36.9	235 59.4	35.8	156 22.8	29.6	Eltanin	90 58.9	N51 29.3
A	09	304 53.8	284 56.6	·· 34.9	338 13.3	·· 36.2	251 01.5	·· 35.9	171 25.4	·· 29.6	Enif	34 14.2	N 9 46.2
T	10	319 56.3	299 58.8	35.4	353 13.8	35.6	266 03.5	36.0	186 28.0	29.7	Fomalhaut	15 54.4	S29 44.6
U	11	334 58.7	315 01.1	35.8	8 14.4	34.9	281 05.6	36.1	201 30.5	29.7			
R	12	350 01.2	330 03.3	N15 36.3	23 14.9	S14 34.3	296 07.6	N18 36.2	216 33.1	N18 29.7	Gacrux	172 30.7	S56 59.2
D	13	5 03.7	345 05.6	36.7	38 15.5	33.7	311 09.7	36.3	231 35.7	29.8	Gienah	176 20.1	S17 25.1
A	14	20 06.1	0 07.9	37.2	53 16.1	33.0	326 11.8	36.4	246 38.3	29.8	Hadar	149 26.1	S60 15.7
Y	15	35 08.6	15 10.1	·· 37.6	68 16.6	·· 32.4	341 13.8	·· 36.5	261 40.9	·· 29.8	Hamal	328 31.8	N23 21.3
	16	50 11.1	30 12.4	38.1	83 17.2	31.7	356 15.9	36.6	276 43.5	29.9	Kaus Aust.	84 20.1	S34 23.6
	17	65 13.5	45 14.7	38.5	98 17.7	31.1	11 17.9	36.7	291 46.1	29.9			
	18	80 16.0	60 17.0	N15 38.9	113 18.3	S14 30.5	26 20.0	N18 36.8	306 48.7	N18 29.9	Kochab	137 18.3	N74 14.7
	19	95 18.4	75 19.3	39.4	128 18.9	29.8	41 22.0	36.9	321 51.3	30.0	Markab	14 05.8	N15 04.9
	20	110 20.9	90 21.5	39.8	143 19.4	29.2	56 24.1	37.0	336 53.9	30.0	Menkar	314 43.8	N 3 59.9
	21	125 23.4	105 23.8	·· 40.3	158 20.0	·· 28.5	71 26.2	·· 37.1	351 56.5	·· 30.0	Menkent	148 39.5	S36 15.5
	22	140 25.8	120 26.1	40.7	173 20.6	27.9	86 28.2	37.2	6 59.1	30.1	Miaplacidus	221 44.6	S69 37.7
	23	155 28.3	135 28.4	41.1	188 21.1	27.3	101 30.3	37.3	22 01.6	30.1			
	13 00	170 30.8	150 30.7	N15 41.6	203 21.7	S14 26.6	116 32.3	N18 37.4	37 04.2	N18 30.1	Mirfak	309 19.7	N49 46.9
	01	185 33.2	165 33.0	42.0	218 22.2	26.0	131 34.4	37.5	52 06.8	30.2	Nunki	76 32.2	S26 19.4
	02	200 35.7	180 35.4	42.4	233 22.8	25.3	146 36.4	37.6	67 09.4	30.2	Peacock	54 02.6	S56 48.3
	03	215 38.2	195 37.7	·· 42.8	248 23.4	·· 24.7	161 38.5	·· 37.7	82 12.0	·· 30.3	Pollux	244 00.9	N28 04.8
	04	230 40.6	210 40.0	43.3	263 23.9	24.1	176 40.6	37.8	97 14.6	30.3	Procyon	245 28.1	N 5 16.8
	05	245 43.1	225 42.3	43.7	278 24.5	23.4	191 42.6	37.9	112 17.2	30.3			
	06	260 45.6	240 44.6	N15 44.1	293 25.1	S14 22.8	206 44.7	N18 38.0	127 19.8	N18 30.4	Rasalhague	96 31.8	N12 34.5
	07	275 48.0	255 47.0	44.5	308 25.6	22.1	221 46.7	38.2	142 22.4	30.4	Regulus	208 12.2	N12 04.5
	08	290 50.5	270 49.3	44.9	323 26.2	21.5	236 48.8	38.3	157 25.0	30.4	Rigel	281 38.3	S 8 13.9
S	09	305 52.9	285 51.6	·· 45.3	338 26.7	·· 20.8	251 50.8	·· 38.4	172 27.5	·· 30.5	Rigil Kent.	140 28.5	S60 44.3
U	10	320 55.4	300 54.0	45.8	353 27.3	20.2	266 52.9	38.5	187 30.1	30.5	Sabik	102 43.8	S15 41.8
N	11	335 57.9	315 56.3	46.2	8 27.9	19.6	281 54.9	38.6	202 32.7	30.5			
D	12	351 00.3	330 58.7	N15 46.6	23 28.4	S14 18.9	296 57.0	N18 38.7	217 35.3	N18 30.6	Schedar	350 12.2	N56 24.8
A	13	6 02.8	346 01.0	47.0	38 29.0	18.3	311 59.0	38.8	232 37.9	30.6	Shaula	96 59.0	S37 05.1
Y	14	21 05.3	1 03.4	47.4	53 29.6	17.6	327 01.1	38.9	247 40.5	30.6	Sirius	258 57.7	S16 41.4
	15	36 07.7	16 05.7	·· 47.8	68 30.1	·· 17.0	342 03.1	·· 39.0	262 43.1	·· 30.7	Spica	158 59.7	S11 02.7
	16	51 10.2	31 08.1	48.2	83 30.7	16.3	357 05.2	39.1	277 45.7	30.7	Suhail	223 12.1	S43 20.7
	17	66 12.7	46 10.4	48.6	98 31.3	15.7	12 07.2	39.2	292 48.3	30.7			
	18	81 15.1	61 12.8	N15 49.0	113 31.8	S14 15.0	27 09.3	N18 39.3	307 50.8	N18 30.8	Vega	80 57.6	N38 45.5
	19	96 17.6	76 15.2	49.4	128 32.4	14.4	42 11.3	39.4	322 53.4	30.8	Zuben'ubi	137 35.4	S15 56.9
	20	111 20.0	91 17.6	49.8	143 33.0	13.7	57 13.4	39.5	337 56.0	30.8		S.H.A.	Mer. Pass.
	21	126 22.5	106 19.9	·· 50.2	158 33.5	·· 13.1	72 15.5	·· 39.6	352 58.6	·· 30.9		° ′	h m
	22	141 25.0	121 22.3	50.6	173 34.1	12.5	87 17.5	39.7	8 01.2	30.9	Venus	340 04.8	13 59
	23	156 27.4	136 24.7	50.9	188 34.7	11.8	102 19.6	39.8	23 03.8	30.9	Mars	33 36.6	10 27
	Mer. Pass.	h m 12 39.8	v 2.3	d 0.5	v 0.6	d 0.6	v 2.1	d 0.1	v 2.6	d 0.0	Jupiter	306 11.3	16 15
											Saturn	226 30.4	21 32

	G.M.T.	SUN G.H.A.	SUN Dec.	MOON G.H.A.	MOON v	MOON Dec.	MOON d	MOON H.P.
	d h	° ′	° ′	° ′	′	° ′	′	′
	11 00	177 27.3	S 3 50.6	289 14.9	6.4	S17 18.5	4.7	59.5
	01	192 27.5	49.6	303 40.3	6.3	17 23.2	4.5	59.5
	02	207 27.7	48.6	318 05.6	6.3	17 27.7	4.4	59.5
	03	222 27.8	·· 47.6	332 30.9	6.3	17 32.1	4.2	59.5
	04	237 28.0	46.6	346 56.2	6.3	17 36.3	4.2	59.5
	05	252 28.2	45.7	1 21.5	6.3	17 40.5	4.0	59.5
	06	267 28.3	S 3 44.7	15 46.8	6.3	S17 44.5	3.9	59.5
	07	282 28.5	43.7	30 12.1	6.3	17 48.4	3.8	59.4
	08	297 28.6	42.7	44 37.4	6.3	17 52.2	3.7	59.4
F	09	312 28.8	·· 41.7	59 02.7	6.2	17 55.9	3.5	59.4
R	10	327 29.0	40.8	73 27.9	6.3	17 59.4	3.5	59.4
I	11	342 29.1	39.8	87 53.2	6.2	18 02.9	3.3	59.4
D	12	357 29.3	S 3 38.8	102 18.4	6.3	S18 06.2	3.2	59.4
A	13	12 29.5	37.8	116 43.7	6.2	18 09.4	3.1	59.4
Y	14	27 29.6	36.8	131 08.9	6.2	18 12.5	2.9	59.3
	15	42 29.8	·· 35.8	145 34.1	6.3	18 15.4	2.8	59.3
	16	57 30.0	34.9	159 59.4	6.2	18 18.2	2.8	59.3
	17	72 30.1	33.9	174 24.6	6.3	18 21.0	2.5	59.3
	18	87 30.3	S 3 32.9	188 49.9	6.2	S18 23.5	2.5	59.3
	19	102 30.5	31.9	203 15.1	6.2	18 26.0	2.3	59.3
	20	117 30.6	30.9	217 40.3	6.3	18 28.3	2.3	59.3
	21	132 30.8	·· 29.9	232 05.6	6.2	18 30.6	2.1	59.2
	22	147 31.0	29.0	246 30.8	6.3	18 32.7	1.9	59.2
	23	162 31.1	28.0	260 56.1	6.2	18 34.6	1.9	59.2
	12 00	177 31.3	S 3 27.0	275 21.3	6.3	S18 36.5	1.7	59.2
	01	192 31.5	26.0	289 46.6	6.3	18 38.2	1.6	59.2
	02	207 31.6	25.0	304 11.9	6.2	18 39.8	1.5	59.2
	03	222 31.8	·· 24.1	318 37.1	6.3	18 41.3	1.4	59.1
	04	237 32.0	23.1	333 02.4	6.3	18 42.7	1.2	59.1
	05	252 32.1	22.1	347 27.7	6.3	18 43.9	1.1	59.1
	06	267 32.3	S 3 21.1	1 53.0	6.4	S18 45.0	1.0	59.1
	07	282 32.5	20.1	16 18.4	6.3	18 46.0	0.9	59.1
S	08	297 32.6	19.1	30 43.7	6.4	18 46.9	0.7	59.1
A	09	312 32.8	·· 18.2	45 09.1	6.3	18 47.6	0.7	59.1
T	10	327 33.0	17.2	59 34.4	6.4	18 48.3	0.5	59.0
U	11	342 33.1	16.2	73 59.8	6.4	18 48.8	0.3	59.0
R	12	357 33.3	S 3 15.2	88 25.2	6.4	S18 49.1	0.3	59.0
D	13	12 33.5	14.2	102 50.6	6.5	18 49.4	0.1	59.0
A	14	27 33.6	13.2	117 16.1	6.4	18 49.5	0.1	59.0
Y	15	42 33.8	·· 12.3	131 41.5	6.5	18 49.6	0.2	59.0
	16	57 34.0	11.3	146 07.0	6.5	18 49.4	0.2	58.9
	17	72 34.2	10.3	160 32.5	6.6	18 49.2	0.3	58.9
	18	87 34.3	S 3 09.3	174 58.1	6.5	S18 48.9	0.5	58.9
	19	102 34.5	08.3	189 23.6	6.6	18 48.4	0.6	58.9
	20	117 34.7	07.3	203 49.2	6.6	18 47.8	0.7	58.9
	21	132 34.8	·· 06.3	218 14.8	6.6	18 47.1	0.8	58.8
	22	147 35.0	05.4	232 40.4	6.7	18 46.3	1.0	58.8
	23	162 35.2	04.4	247 06.1	6.7	18 45.3	1.1	58.8
	13 00	177 35.3	S 3 03.4	261 31.8	6.7	S18 44.2	1.1	58.8
	01	192 35.5	02.4	275 57.5	6.7	18 43.1	1.3	58.8
	02	207 35.7	01.4	290 23.2	6.8	18 41.8	1.5	58.8
	03	222 35.8	3 00.4	304 49.0	6.8	18 40.3	1.5	58.7
	04	237 36.0	2 59.5	319 14.8	6.9	18 38.8	1.7	58.7
	05	252 36.2	58.5	333 40.7	6.8	18 37.1	1.8	58.7
	06	267 36.4	S 2 57.5	348 06.5	7.0	S18 35.3	1.8	58.7
	07	282 36.5	56.5	2 32.5	6.9	18 33.5	2.1	58.7
	08	297 36.7	55.5	16 58.4	7.0	18 31.4	2.1	58.7
S	09	312 36.9	·· 54.5	31 24.4	7.0	18 29.3	2.2	58.6
U	10	327 37.0	53.5	45 50.4	7.1	18 27.1	2.4	58.6
N	11	342 37.2	52.6	60 16.5	7.1	18 24.7	2.4	58.6
D	12	357 37.4	S 2 51.6	74 42.6	7.1	S18 22.3	2.6	58.6
A	13	12 37.6	50.6	89 08.7	7.2	18 19.7	2.7	58.6
Y	14	27 37.7	49.6	103 34.9	7.2	18 17.0	2.8	58.5
	15	42 37.9	·· 48.6	118 01.1	7.2	18 14.2	2.9	58.5
	16	57 38.1	47.6	132 27.3	7.3	18 11.3	3.1	58.5
	17	72 38.2	46.7	146 53.6	7.4	18 08.2	3.1	58.5
	18	87 38.4	S 2 45.7	161 20.0	7.4	S18 05.1	3.3	58.5
	19	102 38.6	44.7	175 46.4	7.4	18 01.8	3.3	58.5
	20	117 38.8	43.7	190 12.8	7.5	17 58.5	3.5	58.4
	21	132 38.9	·· 42.7	204 39.3	7.5	17 55.0	3.6	58.4
	22	147 39.1	41.7	219 05.8	7.6	17 51.4	3.7	58.4
	23	162 39.3	40.7	233 32.4	7.6	17 47.7	3.7	58.4
		S.D. 16.1	d 1.0	S.D. 16.2		16.1		16.0

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 11	Moonrise 12	Moonrise 13	Moonrise 14
°	h m	h m	h m	h m	h m	h m	h m
N 72	04 12	05 33	06 40	04 16	■	■	06 42
N 70	04 24	05 37	06 37	02 54	04 29	05 22	05 40
68	04 33	05 39	06 34	02 16	03 38	04 34	05 05
66	04 41	05 41	06 32	01 49	03 06	04 03	04 40
64	04 47	05 43	06 30	01 29	02 42	03 39	04 20
62	04 52	05 44	06 28	01 12	02 24	03 21	04 04
60	04 57	05 45	06 26	00 58	02 08	03 06	03 50
N 58	05 00	05 46	06 25	00 46	01 55	02 53	03 39
56	05 04	05 47	06 24	00 36	01 44	02 42	03 28
54	05 06	05 47	06 23	00 27	01 34	02 32	03 20
52	05 09	05 48	06 22	00 19	01 25	02 23	03 12
50	05 11	05 49	06 21	00 12	01 17	02 15	03 04
45	05 15	05 49	06 19	25 01	01 01	01 58	02 49
N 40	05 18	05 50	06 17	24 47	00 47	01 45	02 36
35	05 21	05 50	06 15	24 35	00 35	01 33	02 25
30	05 22	05 50	06 14	24 25	00 25	01 23	02 16
20	05 24	05 49	06 11	24 08	00 08	01 05	02 00
N 10	05 23	05 48	06 09	23 53	24 50	00 50	01 45
0	05 22	05 46	06 07	23 38	24 36	00 36	01 32
S 10	05 19	05 43	06 04	23 24	24 22	00 22	01 19
20	05 14	05 39	06 01	23 09	24 06	00 06	01 04
30	05 06	05 34	05 58	22 52	23 49	24 48	00 48
35	05 01	05 31	05 56	22 42	23 39	24 39	00 39
40	04 55	05 27	05 54	22 31	23 27	24 28	00 28
45	04 47	05 22	05 52	22 17	23 14	24 15	00 15
S 50	04 37	05 16	05 49	22 01	22 57	23 59	25 06
52	04 32	05 13	05 47	21 53	22 49	23 52	25 00
54	04 27	05 10	05 46	21 45	22 41	23 44	24 53
56	04 20	05 06	05 44	21 35	22 31	23 35	24 45
58	04 13	05 02	05 42	21 24	22 20	23 25	24 36
S 60	04 05	04 57	05 40	21 12	22 07	23 13	24 26

Lat.	Sunset	Twilight Civil	Twilight Naut.	Moonset 11	Moonset 12	Moonset 13	Moonset 14
°	h m	h m	h m	h m	h m	h m	h m
N 72	17 42	18 49	20 11	05 25	■	■	08 57
N 70	17 45	18 45	19 59	06 47	07 14	08 21	09 58
68	17 47	18 43	19 49	07 26	08 05	09 08	10 33
66	17 50	18 41	19 41	07 53	08 37	09 39	10 58
64	17 51	18 39	19 35	08 14	09 00	10 02	11 17
62	17 53	18 37	19 29	08 31	09 19	10 20	11 33
60	17 54	18 36	19 25	08 45	09 35	10 35	11 46
N 58	17 56	18 35	19 21	08 58	09 48	10 48	11 57
56	17 57	18 34	19 17	09 08	09 59	10 59	12 07
54	17 58	18 33	19 14	09 17	10 09	11 09	12 16
52	17 59	18 33	19 12	09 26	10 18	11 18	12 23
50	18 00	18 32	19 10	09 33	10 26	11 25	12 30
45	18 02	18 31	19 05	09 49	10 43	11 42	12 45
N 40	18 03	18 30	19 02	10 02	10 57	11 55	12 57
35	18 05	18 30	19 00	10 13	11 08	12 07	13 08
30	18 06	18 30	18 58	10 23	11 19	12 17	13 17
20	18 09	18 31	18 56	10 40	11 36	12 34	13 32
N 10	18 11	18 32	18 56	10 54	11 52	12 49	13 46
0	18 13	18 34	18 58	11 08	12 06	13 03	13 58
S 10	18 15	18 36	19 01	11 22	12 20	13 17	14 11
20	18 18	18 40	19 06	11 36	12 36	13 32	14 24
30	18 21	18 45	19 13	11 53	12 53	13 49	14 39
35	18 23	18 48	19 18	12 03	13 03	13 58	14 48
40	18 25	18 52	19 24	12 14	13 15	14 10	14 58
45	18 27	18 57	19 31	12 27	13 28	14 23	15 10
S 50	18 30	19 02	19 41	12 43	13 45	14 39	15 24
52	18 31	19 05	19 46	12 51	13 53	14 46	15 30
54	18 33	19 08	19 51	12 59	14 02	14 54	15 38
56	18 34	19 12	19 58	13 09	14 12	15 04	15 46
58	18 36	19 16	20 04	13 19	14 23	15 14	15 55
S 60	18 38	19 21	20 13	13 31	14 36	15 26	16 05

Day	SUN Eqn. of Time 00ʰ	SUN Eqn. of Time 12ʰ	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
	m s	m s	h m	h m	h m	d	
11	10 11	10 03	12 10	04 54	17 23	21	
12	09 55	09 47	12 10	05 52	18 21	22	◑
13	09 39	09 31	12 10	06 49	19 18	23	

1977 MARCH 14, 15, 16 (MON., TUES., WED.)

G.M.T.		ARIES	VENUS −4.2		MARS +1.4		JUPITER −1.7		SATURN +0.3	
		G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
d	h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
14	00	171 29.9	151 27.1	N15 51.3	203 35.2	S14 11.2	117 21.6	N18 39.9	38 06.4	N18 31.0
	01	186 32.4	166 29.5	51.7	218 35.8	10.5	132 23.7	40.0	53 09.0	31.0
	02	201 34.8	181 31.9	52.1	233 36.4	09.9	147 25.7	40.1	68 11.5	31.0
	03	216 37.3	196 34.3	·· 52.5	248 36.9	·· 09.2	162 27.8	·· 40.2	83 14.1	·· 31.1
	04	231 39.8	211 36.7	52.9	263 37.5	08.6	177 29.8	40.3	98 16.7	31.1
	05	246 42.2	226 39.1	53.2	278 38.1	07.9	192 31.9	40.4	113 19.3	31.1
	06	261 44.7	241 41.5	N15 53.6	293 38.6	S14 07.3	207 33.9	N18 40.5	128 21.9	N18 31.2
	07	276 47.2	256 43.9	54.0	308 39.2	06.6	222 36.0	40.6	143 24.5	31.2
	08	291 49.6	271 46.4	54.4	323 39.8	06.0	237 38.0	40.7	158 27.1	31.2
M	09	306 52.1	286 48.8	·· 54.7	338 40.3	·· 05.3	252 40.1	·· 40.8	173 29.6	·· 31.3
O	10	321 54.5	301 51.2	55.1	353 40.9	04.7	267 42.1	40.9	188 32.2	31.3
N	11	336 57.0	316 53.6	55.5	8 41.5	04.0	282 44.1	41.0	203 34.8	31.3
D	12	351 59.5	331 56.1	N15 55.8	23 42.0	S14 03.4	297 46.2	N18 41.1	218 37.4	N18 31.4
A	13	7 01.9	346 58.5	56.2	38 42.6	02.7	312 48.2	41.2	233 40.0	31.4
Y	14	22 04.4	2 01.0	56.5	53 43.2	02.1	327 50.3	41.3	248 42.6	31.4
	15	37 06.9	17 03.4	·· 56.9	68 43.7	·· 01.4	342 52.3	·· 41.4	263 45.2	·· 31.5
	16	52 09.3	32 05.9	57.2	83 44.3	00.8	357 54.4	41.5	278 47.7	31.5
	17	67 11.8	47 08.3	57.6	98 44.9	14 00.1	12 56.4	41.6	293 50.3	31.5
	18	82 14.3	62 10.8	N15 57.9	113 45.5	S13 59.5	27 58.5	N18 41.7	308 52.9	N18 31.6
	19	97 16.7	77 13.2	58.3	128 46.0	58.8	43 00.5	41.8	323 55.5	31.6
	20	112 19.2	92 15.7	58.6	143 46.6	58.2	58 02.6	41.9	338 58.1	31.6
	21	127 21.7	107 18.2	·· 59.0	158 47.2	·· 57.5	73 04.6	·· 42.0	354 00.7	·· 31.7
	22	142 24.1	122 20.6	59.3	173 47.7	56.9	88 06.7	42.1	9 03.2	31.7
	23	157 26.6	137 23.1	15 59.7	188 48.3	56.2	103 08.7	42.3	24 05.8	31.7
15	00	172 29.0	152 25.6	N16 00.0	203 48.9	S13 55.6	118 10.8	N18 42.4	39 08.4	N18 31.8
	01	187 31.5	167 28.1	00.4	218 49.4	54.9	133 12.8	42.5	54 11.0	31.8
	02	202 34.0	182 30.6	00.7	233 50.0	54.2	148 14.8	42.6	69 13.6	31.8
	03	217 36.4	197 33.1	·· 01.0	248 50.6	·· 53.6	163 16.9	·· 42.7	84 16.2	·· 31.9
	04	232 38.9	212 35.5	01.3	263 51.2	52.9	178 18.9	42.8	99 18.7	31.9
	05	247 41.4	227 38.0	01.7	278 51.7	52.3	193 21.0	42.9	114 21.3	31.9
	06	262 43.8	242 40.5	N16 02.0	293 52.3	S13 51.6	208 23.0	N18 43.0	129 23.9	N18 32.0
	07	277 46.3	257 43.1	02.3	308 52.9	51.0	223 25.1	43.1	144 26.5	32.0
T	08	292 48.8	272 45.6	02.7	323 53.4	50.3	238 27.1	43.2	159 29.1	32.0
U	09	307 51.2	287 48.1	·· 03.0	338 54.0	·· 49.7	253 29.2	·· 43.3	174 31.7	·· 32.1
E	10	322 53.7	302 50.6	03.3	353 54.6	49.0	268 31.2	43.4	189 34.2	32.1
S	11	337 56.1	317 53.1	03.6	8 55.2	48.4	283 33.2	43.5	204 36.8	32.1
D	12	352 58.6	332 55.6	N16 03.9	23 55.7	S13 47.7	298 35.3	N18 43.6	219 39.4	N18 32.2
A	13	8 01.1	347 58.2	04.2	38 56.3	47.0	313 37.3	43.7	234 42.0	32.2
Y	14	23 03.5	3 00.7	04.5	53 56.9	46.4	328 39.4	43.8	249 44.6	32.2
	15	38 06.0	18 03.2	·· 04.9	68 57.4	·· 45.7	343 41.4	·· 43.9	264 47.1	·· 32.3
	16	53 08.5	33 05.8	05.2	83 58.0	45.1	358 43.5	44.0	279 49.7	32.3
	17	68 10.9	48 08.3	05.5	98 58.6	44.4	13 45.5	44.1	294 52.3	32.3
	18	83 13.4	63 10.9	N16 05.8	113 59.2	S13 43.8	28 47.5	N18 44.2	309 54.9	N18 32.4
	19	98 15.9	78 13.4	06.1	128 59.7	43.1	43 49.6	44.3	324 57.5	32.4
	20	113 18.3	93 16.0	06.4	144 00.3	42.4	58 51.6	44.4	340 00.0	32.4
	21	128 20.8	108 18.5	·· 06.7	159 00.9	·· 41.8	73 53.7	·· 44.5	355 02.6	·· 32.4
	22	143 23.3	123 21.1	07.0	174 01.5	41.1	88 55.7	44.6	10 05.2	32.5
	23	158 25.7	138 23.7	07.3	189 02.0	40.5	103 57.7	44.7	25 07.8	32.5
16	00	173 28.2	153 26.2	N16 07.5	204 02.6	S13 39.8	118 59.8	N18 44.8	40 10.4	N18 32.5
	01	188 30.6	168 28.8	07.8	219 03.2	39.2	134 01.8	44.9	55 12.9	32.6
	02	203 33.1	183 31.4	08.1	234 03.8	38.5	149 03.9	45.0	70 15.5	32.6
	03	218 35.6	198 34.0	·· 08.4	249 04.3	·· 37.8	164 05.9	·· 45.1	85 18.1	·· 32.6
	04	233 38.0	213 36.6	08.7	264 04.9	37.2	179 07.9	45.3	100 20.7	32.7
	05	248 40.5	228 39.2	09.0	279 05.5	36.5	194 10.0	45.4	115 23.3	32.7
	06	263 43.0	243 41.7	N16 09.2	294 06.1	S13 35.9	209 12.0	N18 45.5	130 25.8	N18 32.7
W	07	278 45.4	258 44.3	09.5	309 06.6	35.2	224 14.1	45.6	145 28.4	32.8
E	08	293 47.9	273 46.9	09.8	324 07.2	34.5	239 16.1	45.7	160 31.0	32.8
D	09	308 50.4	288 49.5	·· 10.1	339 07.8	·· 33.9	254 18.1	·· 45.8	175 33.6	·· 32.8
N	10	323 52.8	303 52.2	10.3	354 08.4	33.2	269 20.2	45.9	190 36.1	32.9
E	11	338 55.3	318 54.8	10.6	9 08.9	32.6	284 22.2	46.0	205 38.7	32.9
S	12	353 57.8	333 57.4	N16 10.9	24 09.5	S13 31.9	299 24.3	N18 46.1	220 41.3	N18 32.9
D	13	9 00.2	349 00.0	11.1	39 10.1	31.2	314 26.3	46.2	235 43.9	32.9
A	14	24 02.7	4 02.6	11.4	54 10.7	30.6	329 28.3	46.3	250 46.5	33.0
Y	15	39 05.1	19 05.3	·· 11.7	69 11.2	·· 29.9	344 30.4	·· 46.4	265 49.0	·· 33.0
	16	54 07.6	34 07.9	11.9	84 11.8	29.2	359 32.4	46.5	280 51.6	33.0
	17	69 10.1	49 10.5	12.2	99 12.4	28.6	14 34.4	46.6	295 54.2	33.1
	18	84 12.5	64 13.2	N16 12.4	114 13.0	S13 27.9	29 36.5	N18 46.7	310 56.8	N18 33.1
	19	99 15.0	79 15.8	12.7	129 13.5	27.3	44 38.5	46.8	325 59.3	33.1
	20	114 17.5	94 18.5	12.9	144 14.1	26.6	59 40.5	46.9	341 01.9	33.2
	21	129 19.9	109 21.1	·· 13.2	159 14.7	·· 25.9	74 42.6	·· 47.0	356 04.5	·· 33.2
	22	144 22.4	124 23.8	13.4	174 15.3	25.3	89 44.6	47.1	11 07.1	33.2
	23	159 24.9	139 26.4	13.6	189 15.9	24.6	104 46.7	47.2	26 09.6	33.3
Mer. Pass.		h m 12 28.0	*v* 2.5	*d* 0.3	*v* 0.6	*d* 0.7	*v* 2.0	*d* 0.1	*v* 2.6	*d* 0.0

STARS		
Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 39.3	S40 24.0
Achernar	335 47.6	S57 21.3
Acrux	173 39.1	S62 58.4
Adhara	255 33.8	S28 56.8
Aldebaran	291 20.8	N16 27.7
Alioth	166 44.1	N56 04.8
Alkaid	153 20.0	N49 25.4
Al Na'ir	28 18.4	S47 04.2
Alnilam	276 14.1	S 1 13.2
Alphard	218 22.6	S 8 33.8
Alphecca	126 33.9	N26 47.3
Alpheratz	358 12.1	N28 57.8
Altair	62 35.0	N 8 48.4
Ankaa	353 43.0	S42 25.9
Antares	112 59.6	S26 22.8
Arcturus	146 20.4	N19 17.9
Atria	108 25.9	S68 58.9
Avior	234 28.7	S59 26.6
Bellatrix	279 01.3	N 6 19.6
Betelgeuse	271 30.8	N 7 24.0
Canopus	264 08.1	S52 41.4
Capella	281 14.8	N45 58.6
Deneb	49 50.4	N45 11.8
Denebola	183 01.1	N14 41.8
Diphda	349 23.6	S18 06.8
Dubhe	194 24.4	N61 52.3
Elnath	278 47.1	N28 35.3
Eltanin	90 58.9	N51 29.3
Enif	34 14.2	N 9 46.2
Fomalhaut	15 54.4	S29 44.6
Gacrux	172 30.7	S56 59.2
Gienah	176 20.0	S17 25.1
Hadar	149 26.1	S60 15.7
Hamal	328 31.8	N23 21.2
Kaus Aust.	84 20.0	S34 23.6
Kochab	137 18.3	N74 14.7
Markab	14 05.8	N15 04.9
Menkar	314 43.8	N 3 59.9
Menkent	148 39.4	S36 15.5
Miaplacidus	221 44.6	S69 37.7
Mirfak	309 19.7	N49 46.9
Nunki	76 32.2	S26 19.4
Peacock	54 02.5	S56 48.3
Pollux	244 00.9	N28 04.8
Procyon	245 28.1	N 5 16.8
Rasalhague	96 31.8	N12 34.5
Regulus	208 12.2	N12 04.5
Rigel	281 38.3	S 8 13.9
Rigil Kent.	140 28.5	S60 44.3
Sabik	102 43.8	S15 41.8
Schedar	350 12.2	N56 24.8
Shaula	96 58.9	S37 05.1
Sirius	258 57.7	S16 41.4
Spica	158 59.7	S11 02.7
Suhail	223 12.1	S43 20.8
Vega	80 57.5	N38 45.5
Zuben'ubi	137 35.4	S15 56.9

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	339 56.5	13 48
Mars	31 19.8	10 24
Jupiter	305 41.7	16 05
Saturn	226 39.4	21 20

G.M.T.	SUN G.H.A.	SUN Dec.	MOON G.H.A.	MOON v	MOON Dec.	MOON d	MOON H.P.
d h	° ′	° ′	° ′	′	° ′	′	′
14 00	177 39.4	S 2 39.8	247 59.0	7.6	S17 44.0	3.9	58.4
01	192 39.6	38.8	262 25.6	7.7	17 40.1	4.0	58.3
02	207 39.8	37.8	276 52.3	7.8	17 36.1	4.2	58.3
03	222 40.0	·· 36.8	291 19.1	7.8	17 31.9	4.2	58.3
04	237 40.1	35.8	305 45.9	7.8	17 27.7	4.3	58.3
05	252 40.3	34.8	320 12.7	7.9	17 23.4	4.4	58.3
06	267 40.5	S 2 33.8	334 39.6	8.0	S17 19.0	4.5	58.2
07	282 40.6	32.9	349 06.6	8.0	17 14.5	4.6	58.2
08	297 40.8	31.9	3 33.6	8.0	17 09.9	4.7	58.2
M 09	312 41.0	·· 30.9	18 00.6	8.1	17 05.2	4.9	58.2
O 10	327 41.2	29.9	32 27.7	8.2	17 00.3	4.9	58.2
N 11	342 41.3	28.9	46 54.9	8.2	16 55.4	5.0	58.1
D 12	357 41.5	S 2 27.9	61 22.1	8.3	S16 50.4	5.1	58.1
A 13	12 41.7	26.9	75 49.4	8.3	16 45.3	5.2	58.1
Y 14	27 41.9	26.0	90 16.7	8.3	16 40.1	5.3	58.1
15	42 42.0	·· 25.0	104 44.0	8.5	16 34.8	5.4	58.1
16	57 42.2	24.0	119 11.5	8.4	16 29.4	5.5	58.1
17	72 42.4	23.0	133 38.9	8.6	16 23.9	5.6	58.0
18	87 42.6	S 2 22.0	148 06.5	8.5	S16 18.3	5.7	58.0
19	102 42.7	21.0	162 34.0	8.7	16 12.6	5.7	58.0
20	117 42.9	20.0	177 01.7	8.7	16 06.9	5.9	58.0
21	132 43.1	·· 19.0	191 29.4	8.7	16 01.0	5.9	58.0
22	147 43.3	18.1	205 57.1	8.8	15 55.1	6.1	57.9
23	162 43.4	17.1	220 24.9	8.9	15 49.0	6.1	57.9
15 00	177 43.6	S 2 16.1	234 52.8	8.9	S15 42.9	6.2	57.9
01	192 43.8	15.1	249 20.7	8.9	15 36.7	6.3	57.9
02	207 44.0	14.1	263 48.6	9.1	15 30.4	6.4	57.9
03	222 44.1	·· 13.1	278 16.7	9.0	15 24.0	6.4	57.8
04	237 44.3	12.1	292 44.7	9.2	15 17.6	6.6	57.8
05	252 44.5	11.1	307 12.9	9.2	15 11.0	6.6	57.8
06	267 44.7	S 2 10.2	321 41.1	9.2	S15 04.4	6.7	57.8
07	282 44.8	09.2	336 09.3	9.3	14 57.7	6.8	57.8
T 08	297 45.0	08.2	350 37.6	9.4	14 50.9	6.9	57.7
U 09	312 45.2	·· 07.2	5 06.0	9.4	14 44.0	6.9	57.7
E 10	327 45.4	06.2	19 34.4	9.5	14 37.1	7.1	57.7
S 11	342 45.5	05.2	34 02.9	9.5	14 30.0	7.1	57.7
D 12	357 45.7	S 2 04.2	48 31.4	9.6	S14 22.9	7.2	57.7
A 13	12 45.9	03.3	63 00.0	9.7	14 15.7	7.2	57.6
Y 14	27 46.1	02.3	77 28.7	9.7	14 08.5	7.3	57.6
15	42 46.2	·· 01.3	91 57.4	9.7	14 01.2	7.4	57.6
16	57 46.4	2 00.3	106 26.1	9.8	13 53.8	7.5	57.6
17	72 46.6	1 59.3	120 54.9	9.9	13 46.3	7.6	57.6
18	87 46.8	S 1 58.3	135 23.8	9.9	S13 38.7	7.6	57.5
19	102 46.9	57.3	149 52.7	10.0	13 31.1	7.7	57.5
20	117 47.1	56.3	164 21.7	10.1	13 23.4	7.7	57.5
21	132 47.3	·· 55.4	178 50.8	10.1	13 15.7	7.8	57.5
22	147 47.5	54.4	193 19.9	10.1	13 07.9	7.9	57.5
23	162 47.6	53.4	207 49.0	10.2	13 00.0	8.0	57.4
16 00	177 47.8	S 1 52.4	222 18.2	10.3	S12 52.0	8.0	57.4
01	192 48.0	51.4	236 47.5	10.3	12 44.0	8.1	57.4
02	207 48.2	50.4	251 16.8	10.4	12 35.9	8.1	57.4
03	222 48.4	·· 49.4	265 46.2	10.4	12 27.8	8.2	57.4
04	237 48.5	48.4	280 15.6	10.5	12 19.6	8.3	57.3
05	252 48.7	47.5	294 45.1	10.6	12 11.3	8.3	57.3
06	267 48.9	S 1 46.5	309 14.7	10.5	S12 03.0	8.4	57.3
W 07	282 49.1	45.5	323 44.2	10.7	11 54.6	8.5	57.3
E 08	297 49.2	44.5	338 13.9	10.7	11 46.1	8.5	57.3
D 09	312 49.4	·· 43.5	352 43.6	10.8	11 37.6	8.5	57.2
N 10	327 49.6	42.5	7 13.4	10.8	11 29.1	8.7	57.2
E 11	342 49.8	41.5	21 43.2	10.8	11 20.4	8.6	57.2
S 12	357 50.0	S 1 40.5	36 13.0	10.9	S11 11.8	8.7	57.2
D 13	12 50.1	39.5	50 42.9	11.0	11 03.1	8.8	57.2
A 14	27 50.3	38.6	65 12.9	11.0	10 54.3	8.8	57.1
Y 15	42 50.5	·· 37.6	79 42.9	11.1	10 45.5	8.9	57.1
16	57 50.7	36.6	94 13.0	11.1	10 36.6	8.9	57.1
17	72 50.8	35.6	108 43.1	11.2	10 27.7	9.0	57.1
18	87 51.0	S 1 34.6	123 13.3	11.2	S10 18.7	9.0	57.1
19	102 51.2	33.6	137 43.5	11.3	10 09.7	9.1	57.0
20	117 51.4	32.6	152 13.8	11.4	10 00.6	9.1	57.0
21	132 51.6	·· 31.6	166 44.2	11.3	9 51.5	9.2	57.0
22	147 51.7	30.7	181 14.5	11.5	9 42.3	9.2	57.0
23	162 51.9	29.7	195 45.0	11.4	9 33.1	9.2	57.0
	S.D. 16.1	d 1.0	S.D. 15.8		15.7		15.6

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 14	Moonrise 15	Moonrise 16	Moonrise 17
°	h m	h m	h m	h m	h m	h m	h m
N 72	03 54	05 18	06 25	06 42	06 20	06 09	06 01
N 70	04 08	05 23	06 23	05 40	05 47	05 49	05 49
68	04 19	05 26	06 22	05 05	05 22	05 32	05 38
66	04 28	05 29	06 20	04 40	05 03	05 19	05 30
64	04 36	05 32	06 19	04 20	04 48	05 08	05 23
62	04 42	05 34	06 18	04 04	04 35	04 58	05 16
60	04 47	05 36	06 17	03 50	04 24	04 50	05 11
N 58	04 52	05 38	06 17	03 39	04 14	04 43	05 06
56	04 55	05 39	06 16	03 28	04 06	04 36	05 02
54	04 59	05 40	06 15	03 20	03 58	04 31	04 58
52	05 02	05 41	06 15	03 12	03 52	04 25	04 54
50	05 04	05 42	06 14	03 04	03 46	04 21	04 51
45	05 10	05 44	06 13	02 49	03 33	04 10	04 44
N 40	05 14	05 45	06 12	02 36	03 22	04 02	04 38
35	05 16	05 46	06 11	02 25	03 12	03 55	04 33
30	05 19	05 46	06 10	02 16	03 04	03 48	04 29
20	05 21	05 47	06 09	02 00	02 50	03 37	04 21
N 10	05 22	05 46	06 07	01 45	02 38	03 27	04 14
0	05 21	05 45	06 06	01 32	02 26	03 18	04 08
S 10	05 19	05 43	06 04	01 19	02 15	03 09	04 01
20	05 15	05 40	06 02	01 04	02 02	02 59	03 54
30	05 08	05 36	06 00	00 48	01 48	02 48	03 46
35	05 04	05 34	05 59	00 39	01 40	02 41	03 42
40	04 58	05 30	05 57	00 28	01 30	02 34	03 37
45	04 51	05 26	05 56	00 15	01 19	02 25	03 31
S 50	04 42	05 21	05 53	25 06	01 06	02 15	03 24
52	04 38	05 19	05 52	25 00	01 00	02 10	03 20
54	04 33	05 16	05 51	24 53	00 53	02 04	03 17
56	04 27	05 13	05 50	24 45	00 45	01 58	03 12
58	04 21	05 09	05 49	24 36	00 36	01 52	03 08
S 60	04 14	05 05	05 47	24 26	00 26	01 44	03 03

Lat.	Sunset	Twilight Civil	Twilight Naut.	Moonset 14	Moonset 15	Moonset 16	Moonset 17
°	h m	h m	h m	h m	h m	h m	h m
N 72	17 55	19 03	20 28	08 57	11 11	13 08	14 57
N 70	17 57	18 58	20 13	09 58	11 43	13 27	15 08
68	17 58	18 54	20 01	10 33	12 07	13 43	15 17
66	17 59	18 50	19 52	10 58	12 25	13 55	15 24
64	18 00	18 48	19 44	11 17	12 40	14 05	15 30
62	18 01	18 45	19 38	11 33	12 52	14 14	15 35
60	18 02	18 43	19 33	11 46	13 02	14 21	15 40
N 58	18 03	18 42	19 28	11 57	13 11	14 28	15 44
56	18 03	18 40	19 24	12 07	13 19	14 33	15 48
54	18 04	18 39	19 20	12 16	13 26	14 39	15 51
52	18 04	18 38	19 17	12 23	13 33	14 43	15 54
50	18 05	18 37	19 15	12 30	13 38	14 47	15 56
45	18 06	18 35	19 09	12 45	13 51	14 56	16 02
N 40	18 07	18 34	19 05	12 57	14 01	15 04	16 07
35	18 07	18 33	19 02	13 08	14 09	15 10	16 11
30	18 08	18 32	19 00	13 17	14 17	15 16	16 14
20	18 10	18 32	18 57	13 32	14 30	15 26	16 20
N 10	18 11	18 32	18 56	13 46	14 41	15 34	16 26
0	18 12	18 33	18 57	13 58	14 51	15 42	16 31
S 10	18 14	18 35	18 59	14 11	15 02	15 50	16 35
20	18 15	18 37	19 03	14 24	15 13	15 58	16 41
30	18 17	18 41	19 09	14 39	15 25	16 08	16 47
35	18 18	18 44	19 13	14 48	15 33	16 13	16 50
40	18 20	18 47	19 19	14 58	15 41	16 19	16 54
45	18 21	18 51	19 26	15 10	15 51	16 26	16 58
S 50	18 23	18 56	19 34	15 24	16 02	16 35	17 03
52	18 24	18 58	19 39	15 30	16 07	16 39	17 06
54	18 25	19 01	19 43	15 38	16 13	16 43	17 08
56	18 27	19 04	19 49	15 46	16 20	16 48	17 11
58	18 28	19 07	19 55	15 55	16 27	16 53	17 14
S 60	18 29	19 11	20 02	16 05	16 35	16 59	17 18

Day	SUN Eqn. of Time 00ʰ	SUN Eqn. of Time 12ʰ	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
	m s	m s	h m	h m	h m	d	
14	09 23	09 14	12 09	07 45	20 12	24	
15	09 06	08 58	12 09	08 39	21 05	25	◑
16	08 49	08 41	12 09	09 30	21 55	26	

1977 MARCH 17, 18, 19 (THURS., FRI., SAT.)

G.M.T.	ARIES G.H.A.	VENUS −4.1 G.H.A.	VENUS Dec.	MARS +1.4 G.H.A.	MARS Dec.	JUPITER −1.7 G.H.A.	JUPITER Dec.	SATURN +0.3 G.H.A.	SATURN Dec.
d h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
17 00	174 27.3	154 29.1	N16 13.9	204 16.4	S13 23.9	119 48.7	N18 47.3	41 12.2	N18 33.3
01	189 29.8	169 31.7	14.1	219 17.0	23.3	134 50.7	47.4	56 14.8	33.3
02	204 32.2	184 34.4	14.4	234 17.6	22.6	149 52.8	47.5	71 17.4	33.3
03	219 34.7	199 37.1	·· 14.6	249 18.2	·· 21.9	164 54.8	·· 47.6	86 19.9	·· 33.4
04	234 37.2	214 39.8	14.8	264 18.7	21.3	179 56.8	47.8	101 22.5	33.4
05	249 39.6	229 42.4	15.1	279 19.3	20.6	194 58.9	47.9	116 25.1	33.4
06	264 42.1	244 45.1	N16 15.3	294 19.9	S13 20.0	210 00.9	N18 48.0	131 27.7	N18 33.5
07	279 44.6	259 47.8	15.5	309 20.5	19.3	225 02.9	48.1	146 30.2	33.5
T 08	294 47.0	274 50.5	15.7	324 21.1	18.6	240 05.0	48.2	161 32.8	33.5
H 09	309 49.5	289 53.2	·· 15.9	339 21.6	·· 18.0	255 07.0	·· 48.3	176 35.4	·· 33.6
U 10	324 52.0	304 55.9	16.2	354 22.2	17.3	270 09.0	48.4	191 38.0	33.6
R 11	339 54.4	319 58.6	16.4	9 22.8	16.6	285 11.1	48.5	206 40.5	33.6
S 12	354 56.9	335 01.3	N16 16.6	24 23.4	S13 16.0	300 13.1	N18 48.6	221 43.1	N18 33.6
D 13	9 59.4	350 04.0	16.8	39 24.0	15.3	315 15.1	48.7	236 45.7	33.7
A 14	25 01.8	5 06.7	17.0	54 24.5	14.6	330 17.2	48.8	251 48.3	33.7
Y 15	40 04.3	20 09.5	·· 17.2	69 25.1	·· 14.0	345 19.2	·· 48.9	266 50.8	·· 33.7
16	55 06.7	35 12.2	17.4	84 25.7	13.3	0 21.2	49.0	281 53.4	33.8
17	70 09.2	50 14.9	17.6	99 26.3	12.6	15 23.3	49.1	296 56.0	33.8
18	85 11.7	65 17.6	N16 17.8	114 26.9	S13 12.0	30 25.3	N18 49.2	311 58.5	N18 33.8
19	100 14.1	80 20.4	18.0	129 27.4	11.3	45 27.3	49.3	327 01.1	33.9
20	115 16.6	95 23.1	18.2	144 28.0	10.6	60 29.4	49.4	342 03.7	33.9
21	130 19.1	110 25.9	·· 18.4	159 28.6	·· 09.9	75 31.4	·· 49.5	357 06.3	·· 33.9
22	145 21.5	125 28.6	18.6	174 29.2	09.3	90 33.4	49.6	12 08.8	33.9
23	160 24.0	140 31.4	18.8	189 29.8	08.6	105 35.4	49.7	27 11.4	34.0
18 00	175 26.5	155 34.1	N16 19.0	204 30.4	S13 07.9	120 37.5	N18 49.8	42 14.0	N18 34.0
01	190 28.9	170 36.9	19.2	219 30.9	07.3	135 39.5	49.9	57 16.6	34.0
02	205 31.4	185 39.6	19.4	234 31.5	06.6	150 41.5	50.1	72 19.1	34.1
03	220 33.9	200 42.4	·· 19.5	249 32.1	·· 05.9	165 43.6	·· 50.2	87 21.7	·· 34.1
04	235 36.3	215 45.2	19.7	264 32.7	05.3	180 45.6	50.3	102 24.3	34.1
05	250 38.8	230 47.9	19.9	279 33.3	04.6	195 47.6	50.4	117 26.8	34.1
06	265 41.2	245 50.7	N16 20.1	294 33.8	S13 03.9	210 49.7	N18 50.5	132 29.4	N18 34.2
07	280 43.7	260 53.5	20.2	309 34.4	03.2	225 51.7	50.6	147 32.0	34.2
08	295 46.2	275 56.3	20.4	324 35.0	02.6	240 53.7	50.7	162 34.5	34.2
F 09	310 48.6	290 59.1	·· 20.6	339 35.6	·· 01.9	255 55.7	·· 50.8	177 37.1	·· 34.3
R 10	325 51.1	306 01.9	20.7	354 36.2	01.2	270 57.8	50.9	192 39.7	34.3
I 11	340 53.6	321 04.7	20.9	9 36.8	13 00.6	285 59.8	51.0	207 42.3	34.3
D 12	355 56.0	336 07.5	N16 21.1	24 37.3	S12 59.9	301 01.8	N18 51.1	222 44.8	N18 34.3
A 13	10 58.5	351 10.3	21.2	39 37.9	59.2	316 03.9	51.2	237 47.4	34.4
Y 14	26 01.0	6 13.1	21.4	54 38.5	58.5	331 05.9	51.3	252 50.0	34.4
15	41 03.4	21 15.9	·· 21.5	69 39.1	·· 57.9	346 07.9	·· 51.4	267 52.5	·· 34.4
16	56 05.9	36 18.7	21.7	84 39.7	57.2	1 09.9	51.5	282 55.1	34.5
17	71 08.3	51 21.5	21.8	99 40.3	56.5	16 12.0	51.6	297 57.7	34.5
18	86 10.8	66 24.3	N16 22.0	114 40.8	S12 55.9	31 14.0	N18 51.7	313 00.2	N18 34.5
19	101 13.3	81 27.2	22.1	129 41.4	55.2	46 16.0	51.8	328 02.8	34.5
20	116 15.7	96 30.0	22.3	144 42.0	54.5	61 18.0	51.9	343 05.4	34.6
21	131 18.2	111 32.8	·· 22.4	159 42.6	·· 53.8	76 20.1	·· 52.1	358 07.9	·· 34.6
22	146 20.7	126 35.7	22.5	174 43.2	53.2	91 22.1	52.2	13 10.5	34.6
23	161 23.1	141 38.5	22.7	189 43.8	52.5	106 24.1	52.3	28 13.1	34.7
19 00	176 25.6	156 41.4	N16 22.8	204 44.4	S12 51.8	121 26.1	N18 52.4	43 15.6	N18 34.7
01	191 28.1	171 44.2	22.9	219 44.9	51.1	136 28.2	52.5	58 18.2	34.7
02	206 30.5	186 47.1	23.1	234 45.5	50.5	151 30.2	52.6	73 20.8	34.7
03	221 33.0	201 49.9	·· 23.2	249 46.1	·· 49.8	166 32.2	·· 52.7	88 23.3	·· 34.8
04	236 35.5	216 52.8	23.3	264 46.7	49.1	181 34.2	52.8	103 25.9	34.8
05	251 37.9	231 55.7	23.4	279 47.3	48.4	196 36.3	52.9	118 28.5	34.8
06	266 40.4	246 58.5	N16 23.6	294 47.9	S12 47.8	211 38.3	N18 53.0	133 31.0	N18 34.9
07	281 42.8	262 01.4	23.7	309 48.5	47.1	226 40.3	53.1	148 33.6	34.9
S 08	296 45.3	277 04.3	23.8	324 49.1	46.4	241 42.3	53.2	163 36.2	34.9
A 09	311 47.8	292 07.2	·· 23.9	339 49.6	·· 45.7	256 44.4	·· 53.3	178 38.7	·· 34.9
T 10	326 50.2	307 10.0	24.0	354 50.2	45.1	271 46.4	53.4	193 41.3	35.0
U 11	341 52.7	322 12.9	24.1	9 50.8	44.4	286 48.4	53.5	208 43.9	35.0
R 12	356 55.2	337 15.8	N16 24.2	24 51.4	S12 43.7	301 50.4	N18 53.6	223 46.4	N18 35.0
D 13	11 57.6	352 18.7	24.3	39 52.0	43.0	316 52.5	53.7	238 49.0	35.1
A 14	27 00.1	7 21.6	24.4	54 52.6	42.3	331 54.5	53.8	253 51.6	35.1
Y 15	42 02.6	22 24.5	·· 24.5	69 53.2	·· 41.7	346 56.5	·· 54.0	268 54.1	·· 35.1
16	57 05.0	37 27.4	24.6	84 53.8	41.0	1 58.5	54.1	283 56.7	35.1
17	72 07.5	52 30.3	24.7	99 54.3	40.3	17 00.6	54.2	298 59.3	35.2
18	87 10.0	67 33.3	N16 24.8	114 54.9	S12 39.6	32 02.6	N18 54.3	314 01.8	N18 35.2
19	102 12.4	82 36.2	24.9	129 55.5	39.0	47 04.6	54.4	329 04.4	35.2
20	117 14.9	97 39.1	25.0	144 56.1	38.3	62 06.6	54.5	344 07.0	35.2
21	132 17.3	112 42.0	·· 25.1	159 56.7	·· 37.6	77 08.6	·· 54.6	359 09.5	·· 35.3
22	147 19.8	127 45.0	25.1	174 57.3	36.9	92 10.7	54.7	14 12.1	35.3
23	162 22.3	142 47.9	25.2	189 57.9	36.2	107 12.7	54.8	29 14.7	35.3
Mer. Pass.	h m 12 16.2	*v* 2.8	*d* 0.2	*v* 0.6	*d* 0.7	*v* 2.0	*d* 0.1	*v* 2.6	*d* 0.0

STARS

Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 39.3	S40 24.0
Achernar	335 47.6	S57 21.3
Acrux	173 39.1	S62 58.4
Adhara	255 33.8	S28 56.8
Aldebaran	291 20.8	N16 27.7
Alioth	166 44.1	N56 04.8
Alkaid	153 20.0	N49 25.4
Al Na'ir	28 18.3	S47 04.2
Alnilam	276 14.1	S 1 13.2
Alphard	218 22.6	S 8 33.8
Alphecca	126 33.9	N26 47.3
Alpheratz	358 12.1	N28 57.8
Altair	62 35.0	N 8 48.4
Ankaa	353 43.0	S42 25.9
Antares	112 59.6	S26 22.9
Arcturus	146 20.4	N19 17.9
Atria	108 25.8	S68 58.9
Avior	234 28.7	S59 26.6
Bellatrix	279 01.3	N 6 19.6
Betelgeuse	271 30.8	N 7 24.0
Canopus	264 08.2	S52 41.4
Capella	281 14.8	N45 58.6
Deneb	49 50.3	N45 11.8
Denebola	183 01.1	N14 41.8
Diphda	349 23.6	S18 06.8
Dubhe	194 24.4	N61 52.4
Elnath	278 47.1	N28 35.3
Eltanin	90 58.8	N51 29.3
Enif	34 14.2	N 9 46.2
Fomalhaut	15 54.4	S29 44.6
Gacrux	172 30.7	S56 59.2
Gienah	176 20.0	S17 25.1
Hadar	149 26.1	S60 15.7
Hamal	328 31.8	N23 21.2
Kaus Aust.	84 20.0	S34 23.6
Kochab	137 18.2	N74 14.7
Markab	14 05.8	N15 04.9
Menkar	314 43.8	N 3 59.9
Menkent	148 39.4	S36 15.5
Miaplacidus	221 44.7	S69 37.7
Mirfak	309 19.7	N49 46.9
Nunki	76 32.2	S26 19.4
Peacock	54 02.5	S56 48.3
Pollux	244 00.9	N28 04.8
Procyon	245 28.1	N 5 16.8
Rasalhague	96 31.7	N12 34.5
Regulus	208 12.2	N12 04.5
Rigel	281 38.3	S 8 13.9
Rigil Kent.	140 28.5	S60 44.3
Sabik	102 43.8	S15 41.8
Schedar	350 12.2	N56 24.8
Shaula	96 58.9	S37 05.1
Sirius	258 57.7	S16 41.4
Spica	158 59.7	S11 02.7
Suhail	223 12.1	S43 20.8
Vega	80 57.5	N38 45.5
Zuben'ubi	137 35.4	S15 56.9

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	340 07.7	13 35
Mars	29 03.9	10 22
Jupiter	305 11.0	15 55
Saturn	226 47.5	21 07

G.M.T.	SUN G.H.A.	SUN Dec.	MOON G.H.A.	v	MOON Dec.	d	H.P.
d h	° ′	° ′	° ′	′	° ′	′	′
17 00	177 52.1	S 1 28.7	210 15.4	11.6	S 9 23.9	9.3	56.9
01	192 52.3	27.7	224 46.0	11.5	9 14.6	9.3	56.9
02	207 52.4	26.7	239 16.5	11.7	9 05.3	9.4	56.9
03	222 52.6	· · 25.7	253 47.2	11.6	8 55.9	9.4	56.9
04	237 52.8	24.7	268 17.8	11.8	8 46.5	9.4	56.9
05	252 53.0	23.7	282 48.6	11.7	8 37.1	9.5	56.8
06	267 53.2	S 1 22.7	297 19.3	11.8	S 8 27.6	9.5	56.8
07	282 53.3	21.8	311 50.1	11.9	8 18.1	9.6	56.8
T 08	297 53.5	20.8	326 21.0	11.9	8 08.5	9.6	56.8
H 09	312 53.7	· · 19.8	340 51.9	11.9	7 58.9	9.6	56.8
U 10	327 53.9	18.8	355 22.8	12.0	7 49.3	9.6	56.7
R 11	342 54.1	17.8	9 53.8	12.1	7 39.7	9.7	56.7
S 12	357 54.2	S 1 16.8	24 24.9	12.0	S 7 30.0	9.7	56.7
D 13	12 54.4	15.8	38 55.9	12.2	7 20.3	9.8	56.7
A 14	27 54.6	14.8	53 27.1	12.1	7 10.5	9.7	56.7
Y 15	42 54.8	· · 13.9	67 58.2	12.2	7 00.8	9.8	56.6
16	57 55.0	12.9	82 29.4	12.3	6 51.0	9.9	56.6
17	72 55.1	11.9	97 00.7	12.3	6 41.1	9.8	56.6
18	87 55.3	S 1 10.9	111 32.0	12.3	S 6 31.3	9.9	56.6
19	102 55.5	09.9	126 03.3	12.4	6 21.4	9.9	56.6
20	117 55.7	08.9	140 34.7	12.4	6 11.5	9.9	56.5
21	132 55.9	· · 07.9	155 06.1	12.4	6 01.6	10.0	56.5
22	147 56.0	06.9	169 37.5	12.5	5 51.6	9.9	56.5
23	162 56.2	05.9	184 09.0	12.6	5 41.7	10.0	56.5
18 00	177 56.4	S 1 05.0	198 40.6	12.5	S 5 31.7	10.0	56.5
01	192 56.6	04.0	213 12.1	12.6	5 21.7	10.1	56.4
02	207 56.8	03.0	227 43.7	12.7	5 11.6	10.0	56.4
03	222 57.0	· · 02.0	242 15.4	12.7	5 01.6	10.1	56.4
04	237 57.1	01.0	256 47.1	12.7	4 51.5	10.1	56.4
05	252 57.3	1 00.0	271 18.8	12.7	4 41.4	10.1	56.4
06	267 57.5	S 0 59.0	285 50.5	12.8	S 4 31.3	10.1	56.3
07	282 57.7	58.0	300 22.3	12.8	4 21.2	10.1	56.3
08	297 57.9	57.0	314 54.1	12.9	4 11.1	10.1	56.3
F 09	312 58.0	· · 56.1	329 26.0	12.9	4 01.0	10.2	56.3
R 10	327 58.2	55.1	343 57.9	12.9	3 50.8	10.1	56.2
I 11	342 58.4	54.1	358 29.8	12.9	3 40.7	10.2	56.2
D 12	357 58.6	S 0 53.1	13 01.7	13.0	S 3 30.5	10.2	56.2
A 13	12 58.8	52.1	27 33.7	13.0	3 20.3	10.2	56.2
Y 14	27 59.0	51.1	42 05.7	13.1	3 10.1	10.2	56.2
15	42 59.1	· · 50.1	56 37.8	13.0	2 59.9	10.2	56.1
16	57 59.3	49.1	71 09.8	13.1	2 49.7	10.2	56.1
17	72 59.5	48.1	85 41.9	13.2	2 39.5	10.2	56.1
18	87 59.7	S 0 47.2	100 14.1	13.1	S 2 29.3	10.2	56.1
19	102 59.9	46.2	114 46.2	13.2	2 19.1	10.2	56.1
20	118 00.0	45.2	129 18.4	13.2	2 08.9	10.3	56.0
21	133 00.2	· · 44.2	143 50.6	13.3	1 58.6	10.2	56.0
22	148 00.4	43.2	158 22.9	13.3	1 48.4	10.2	56.0
23	163 00.6	42.2	172 55.2	13.3	1 38.2	10.2	56.0
19 00	178 00.8	S 0 41.2	187 27.5	13.3	S 1 28.0	10.3	56.0
01	193 01.0	40.2	201 59.8	13.3	1 17.7	10.2	55.9
02	208 01.1	39.2	216 32.1	13.4	1 07.5	10.2	55.9
03	223 01.3	· · 38.3	231 04.5	13.4	0 57.3	10.2	55.9
04	238 01.5	37.3	245 36.9	13.4	0 47.1	10.3	55.9
05	253 01.7	36.3	260 09.3	13.4	0 36.8	10.2	55.9
06	268 01.9	S 0 35.3	274 41.7	13.5	S 0 26.6	10.2	55.8
07	283 02.1	34.3	289 14.2	13.5	0 16.4	10.2	55.8
S 08	298 02.2	33.3	303 46.7	13.5	S 0 06.2	10.2	55.8
A 09	313 02.4	· · 32.3	318 19.2	13.5	N 0 04.0	10.2	55.8
T 10	328 02.6	31.3	332 51.7	13.6	0 14.2	10.2	55.8
U 11	343 02.8	30.3	347 24.3	13.5	0 24.4	10.1	55.7
R 12	358 03.0	S 0 29.4	1 56.8	13.6	N 0 34.5	10.2	55.7
D 13	13 03.2	28.4	16 29.4	13.6	0 44.7	10.1	55.7
A 14	28 03.3	27.4	31 02.0	13.6	0 54.8	10.2	55.7
Y 15	43 03.5	· · 26.4	45 34.6	13.7	1 05.0	10.1	55.7
16	58 03.7	25.4	60 07.3	13.6	1 15.1	10.1	55.7
17	73 03.9	24.4	74 39.9	13.7	1 25.2	10.1	55.6
18	88 04.1	S 0 23.4	89 12.6	13.7	N 1 35.3	10.1	55.6
19	103 04.3	22.4	103 45.3	13.7	1 45.4	10.1	55.6
20	118 04.4	21.5	118 18.0	13.7	1 55.5	10.0	55.6
21	133 04.6	· · 20.5	132 50.7	13.7	2 05.5	10.1	55.6
22	148 04.8	19.5	147 23.4	13.7	2 15.6	10.0	55.5
23	163 05.0	18.5	161 56.1	13.8	2 25.6	10.0	55.5
	S.D. 16.1	d 1.0	S.D. 15.4		15.3		15.2

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 17	Moonrise 18	Moonrise 19	Moonrise 20
°	h m	h m	h m	h m	h m	h m	h m
N 72	03 36	05 02	06 09	06 01	05 55	05 48	05 42
N 70	03 52	05 08	06 09	05 49	05 48	05 47	05 47
68	04 05	05 14	06 09	05 38	05 43	05 47	05 50
66	04 16	05 18	06 09	05 30	05 39	05 46	05 54
64	04 24	05 21	06 09	05 23	05 35	05 46	05 56
62	04 31	05 24	06 08	05 16	05 32	05 45	05 59
60	04 37	05 27	06 08	05 11	05 29	05 45	06 01
N 58	04 43	05 29	06 08	05 06	05 26	05 45	06 03
56	04 47	05 31	06 08	05 02	05 24	05 44	06 04
54	04 51	05 33	06 08	04 58	05 22	05 44	06 06
52	04 55	05 34	06 08	04 54	05 20	05 44	06 07
50	04 58	05 36	06 08	04 51	05 18	05 44	06 09
45	05 04	05 38	06 07	04 44	05 15	05 43	06 11
N 40	05 09	05 40	06 07	04 38	05 11	05 43	06 14
35	05 12	05 42	06 07	04 33	05 09	05 43	06 16
30	05 15	05 43	06 07	04 29	05 06	05 42	06 18
20	05 19	05 44	06 06	04 21	05 02	05 42	06 21
N 10	05 20	05 45	06 05	04 14	04 58	05 41	06 24
0	05 20	05 44	06 05	04 08	04 55	05 41	06 26
S 10	05 19	05 43	06 04	04 01	04 52	05 41	06 29
20	05 16	05 41	06 03	03 54	04 48	05 40	06 32
30	05 10	05 38	06 02	03 46	04 44	05 40	06 35
35	05 06	05 36	06 01	03 42	04 41	05 40	06 37
40	05 02	05 33	06 01	03 37	04 39	05 39	06 39
45	04 56	05 30	06 00	03 31	04 36	05 39	06 42
S 50	04 48	05 26	05 58	03 24	04 32	05 39	06 45
52	04 44	05 24	05 58	03 20	04 30	05 39	06 46
54	04 39	05 22	05 57	03 17	04 28	05 39	06 48
56	04 34	05 19	05 56	03 12	04 26	05 38	06 49
58	04 29	05 16	05 56	03 08	04 24	05 38	06 51
S 60	04 22	05 13	05 55	03 03	04 21	05 38	06 53

Lat.	Sunset	Twilight Civil	Twilight Naut.	Moonset 17	Moonset 18	Moonset 19	Moonset 20
°	h m	h m	h m	h m	h m	h m	h m
N 72	18 09	19 17	20 45	14 57	16 42	18 23	20 03
N 70	18 09	19 10	20 28	15 08	16 46	18 21	19 54
68	18 09	19 05	20 14	15 17	16 49	18 19	19 47
66	18 09	19 00	20 03	15 24	16 52	18 17	19 41
64	18 09	18 57	19 54	15 30	16 54	18 16	19 37
62	18 09	18 54	19 47	15 35	16 56	18 15	19 32
60	18 09	18 51	19 41	15 40	16 58	18 14	19 29
N 58	18 09	18 48	19 35	15 44	16 59	18 13	19 26
56	18 09	18 46	19 30	15 48	17 01	18 12	19 23
54	18 09	18 45	19 26	15 51	17 02	18 12	19 20
52	18 09	18 43	19 23	15 54	17 03	18 11	19 18
50	18 09	18 42	19 20	15 56	17 04	18 11	19 16
45	18 10	18 39	19 13	16 02	17 06	18 09	19 11
N 40	18 10	18 37	19 08	16 07	17 08	18 08	19 07
35	18 10	18 35	19 05	16 11	17 10	18 07	19 04
30	18 10	18 34	19 02	16 14	17 11	18 07	19 01
20	18 10	18 32	18 58	16 20	17 13	18 05	18 56
N 10	18 11	18 32	18 56	16 26	17 15	18 04	18 52
0	18 11	18 32	18 56	16 31	17 17	18 03	18 48
S 10	18 12	18 33	18 57	16 35	17 19	18 02	18 44
20	18 13	18 35	19 00	16 41	17 21	18 00	18 39
30	18 14	18 38	19 05	16 47	17 23	17 59	18 34
35	18 14	18 40	19 09	16 50	17 25	17 58	18 31
40	18 15	18 42	19 14	16 54	17 26	17 57	18 28
45	18 16	18 45	19 20	16 58	17 28	17 56	18 24
S 50	18 17	18 49	19 27	17 03	17 30	17 55	18 20
52	18 17	18 51	19 31	17 06	17 31	17 54	18 18
54	18 18	18 53	19 35	17 08	17 32	17 54	18 16
56	18 19	18 56	19 40	17 11	17 33	17 53	18 13
58	18 19	18 59	19 46	17 14	17 34	17 52	18 10
S 60	18 20	19 02	19 52	17 18	17 35	17 51	18 07

Day	SUN Eqn. of Time 00ʰ	SUN Eqn. of Time 12ʰ	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
	m s	m s	h m	h m	h m	d	
17	08 32	08 23	12 08	10 19	22 43	27	
18	08 15	08 06	12 08	11 06	23 29	28	●
19	07 57	07 48	12 08	11 52	24 15	29	

1977 MARCH 20, 21, 22 (SUN., MON., TUES.)

	G.M.T.	ARIES	VENUS −4.0		MARS +1.4		JUPITER −1.7		SATURN +0.3	
		G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
	d h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
	20 00	177 24.7	157 50.8	N16 25.3	204 58.5	S12 35.6	122 14.7	N18 54.9	44 17.2	N18 35.4
	01	192 27.2	172 53.8	25.4	219 59.1	34.9	137 16.7	55.0	59 19.8	35.4
	02	207 29.7	187 56.7	25.4	234 59.6	34.2	152 18.7	55.1	74 22.3	35.4
	03	222 32.1	202 59.7	·· 25.5	250 00.2	·· 33.5	167 20.8	·· 55.2	89 24.9	·· 35.4
	04	237 34.6	218 02.6	25.6	265 00.8	32.8	182 22.8	55.3	104 27.5	35.5
	05	252 37.1	233 05.6	25.6	280 01.4	32.2	197 24.8	55.4	119 30.0	35.5
	06	267 39.5	248 08.5	N16 25.7	295 02.0	S12 31.5	212 26.8	N18 55.5	134 32.6	N18 35.5
	07	282 42.0	263 11.5	25.8	310 02.6	30.8	227 28.8	55.6	149 35.2	35.5
	08	297 44.4	278 14.5	25.8	325 03.2	30.1	242 30.9	55.8	164 37.7	35.6
S	09	312 46.9	293 17.4	·· 25.9	340 03.8	·· 29.4	257 32.9	·· 55.9	179 40.3	·· 35.6
U	10	327 49.4	308 20.4	25.9	355 04.4	28.7	272 34.9	56.0	194 42.8	35.6
N	11	342 51.8	323 23.4	26.0	10 05.0	28.1	287 36.9	56.1	209 45.4	35.6
D	12	357 54.3	338 26.4	N16 26.0	25 05.5	S12 27.4	302 38.9	N18 56.2	224 48.0	N18 35.7
A	13	12 56.8	353 29.4	26.1	40 06.1	26.7	317 41.0	56.3	239 50.5	35.7
Y	14	27 59.2	8 32.4	26.1	55 06.7	26.0	332 43.0	56.4	254 53.1	35.7
	15	43 01.7	23 35.4	·· 26.2	70 07.3	·· 25.3	347 45.0	·· 56.5	269 55.6	·· 35.8
	16	58 04.2	38 38.4	26.2	85 07.9	24.6	2 47.0	56.6	284 58.2	35.8
	17	73 06.6	53 41.4	26.2	100 08.5	24.0	17 49.0	56.7	300 00.8	35.8
	18	88 09.1	68 44.4	N16 26.3	115 09.1	S12 23.3	32 51.0	N18 56.8	315 03.3	N18 35.8
	19	103 11.6	83 47.4	26.3	130 09.7	22.6	47 53.1	56.9	330 05.9	35.9
	20	118 14.0	98 50.4	26.3	145 10.3	21.9	62 55.1	57.0	345 08.4	35.9
	21	133 16.5	113 53.4	·· 26.4	160 10.9	·· 21.2	77 57.1	·· 57.1	0 11.0	·· 35.9
	22	148 18.9	128 56.4	26.4	175 11.5	20.5	92 59.1	57.2	15 13.6	35.9
	23	163 21.4	143 59.5	26.4	190 12.1	19.9	108 01.1	57.3	30 16.1	36.0
	21 00	178 23.9	159 02.5	N16 26.4	205 12.7	S12 19.2	123 03.1	N18 57.5	45 18.7	N18 36.0
	01	193 26.3	174 05.5	26.4	220 13.2	18.5	138 05.2	57.6	60 21.2	36.0
	02	208 28.8	189 08.6	26.5	235 13.8	17.8	153 07.2	57.7	75 23.8	36.0
	03	223 31.3	204 11.6	·· 26.5	250 14.4	·· 17.1	168 09.2	·· 57.8	90 26.4	·· 36.1
	04	238 33.7	219 14.6	26.5	265 15.0	16.4	183 11.2	57.9	105 28.9	36.1
	05	253 36.2	234 17.7	26.5	280 15.6	15.8	198 13.2	58.0	120 31.5	36.1
	06	268 38.7	249 20.7	N16 26.5	295 16.2	S12 15.1	213 15.2	N18 58.1	135 34.0	N18 36.1
	07	283 41.1	264 23.8	26.5	310 16.8	14.4	228 17.2	58.2	150 36.6	36.2
	08	298 43.6	279 26.9	26.5	325 17.4	13.7	243 19.3	58.3	165 39.2	36.2
M	09	313 46.1	294 29.9	·· 26.5	340 18.0	·· 13.0	258 21.3	·· 58.4	180 41.7	·· 36.2
O	10	328 48.5	309 33.0	26.5	355 18.6	12.3	273 23.3	58.5	195 44.3	36.2
N	11	343 51.0	324 36.1	26.5	10 19.2	11.6	288 25.3	58.6	210 46.8	36.3
D	12	358 53.4	339 39.1	N16 26.5	25 19.8	S12 10.9	303 27.3	N18 58.7	225 49.4	N18 36.3
A	13	13 55.9	354 42.2	26.4	40 20.4	10.3	318 29.3	58.8	240 51.9	36.3
Y	14	28 58.4	9 45.3	26.4	55 21.0	09.6	333 31.3	58.9	255 54.5	36.3
	15	44 00.8	24 48.4	·· 26.4	70 21.6	·· 08.9	348 33.4	·· 59.1	270 57.1	·· 36.4
	16	59 03.3	39 51.5	26.4	85 22.2	08.2	3 35.4	59.2	285 59.6	36.4
	17	74 05.8	54 54.6	26.4	100 22.8	07.5	18 37.4	59.3	301 02.2	36.4
	18	89 08.2	69 57.7	N16 26.3	115 23.4	S12 06.8	33 39.4	N18 59.4	316 04.7	N18 36.4
	19	104 10.7	85 00.8	26.3	130 24.0	06.1	48 41.4	59.5	331 07.3	36.5
	20	119 13.2	100 03.9	26.3	145 24.6	05.4	63 43.4	59.6	346 09.8	36.5
	21	134 15.6	115 07.0	·· 26.2	160 25.2	·· 04.8	78 45.4	·· 59.7	1 12.4	·· 36.5
	22	149 18.1	130 10.1	26.2	175 25.8	04.1	93 47.4	59.8	16 14.9	36.5
	23	164 20.5	145 13.2	26.2	190 26.3	03.4	108 49.5	18 59.9	31 17.5	36.6
	22 00	179 23.0	160 16.3	N16 26.1	205 26.9	S12 02.7	123 51.5	N19 00.0	46 20.1	N18 36.6
	01	194 25.5	175 19.5	26.1	220 27.5	02.0	138 53.5	00.1	61 22.6	36.6
	02	209 27.9	190 22.6	26.0	235 28.1	01.3	153 55.5	00.2	76 25.2	36.6
	03	224 30.4	205 25.7	·· 26.0	250 28.7	12 00.6	168 57.5	·· 00.3	91 27.7	·· 36.7
	04	239 32.9	220 28.8	25.9	265 29.3	11 59.9	183 59.5	00.4	106 30.3	36.7
	05	254 35.3	235 32.0	25.9	280 29.9	59.2	199 01.5	00.6	121 32.8	36.7
	06	269 37.8	250 35.1	N16 25.8	295 30.5	S11 58.5	214 03.5	N19 00.7	136 35.4	N18 36.7
	07	284 40.3	265 38.3	25.8	310 31.1	57.9	229 05.5	00.8	151 37.9	36.8
T	08	299 42.7	280 41.4	25.7	325 31.7	57.2	244 07.5	00.9	166 40.5	36.8
U	09	314 45.2	295 44.6	·· 25.7	340 32.3	·· 56.5	259 09.6	·· 01.0	181 43.0	·· 36.8
E	10	329 47.7	310 47.7	25.6	355 32.9	55.8	274 11.6	01.1	196 45.6	36.8
S	11	344 50.1	325 50.9	25.5	10 33.5	55.1	289 13.6	01.2	211 48.2	36.9
D	12	359 52.6	340 54.0	N16 25.4	25 34.1	S11 54.4	304 15.6	N19 01.3	226 50.7	N18 36.9
A	13	14 55.0	355 57.2	25.4	40 34.7	53.7	319 17.6	01.4	241 53.3	36.9
Y	14	29 57.5	11 00.4	25.3	55 35.3	53.0	334 19.6	01.5	256 55.8	36.9
	15	45 00.0	26 03.6	·· 25.2	70 35.9	·· 52.3	349 21.6	·· 01.6	271 58.4	·· 37.0
	16	60 02.4	41 06.7	25.1	85 36.5	51.6	4 23.6	01.7	287 00.9	37.0
	17	75 04.9	56 09.9	25.0	100 37.1	50.9	19 25.6	01.8	302 03.5	37.0
	18	90 07.4	71 13.1	N16 25.0	115 37.7	S11 50.2	34 27.6	N19 01.9	317 06.0	N18 37.0
	19	105 09.8	86 16.3	24.9	130 38.3	49.5	49 29.6	02.1	332 08.6	37.1
	20	120 12.3	101 19.5	24.8	145 38.9	48.9	64 31.6	02.2	347 11.1	37.1
	21	135 14.8	116 22.7	·· 24.7	160 39.5	·· 48.2	79 33.7	·· 02.3	2 13.7	·· 37.1
	22	150 17.2	131 25.9	24.6	175 40.1	47.5	94 35.7	02.4	17 16.2	37.1
	23	165 19.7	146 29.1	24.5	190 40.7	46.8	109 37.7	02.5	32 18.8	37.1
	Mer. Pass.	h m 12 04.4	v 3.1	d 0.0	v 0.6	d 0.7	v 2.0	d 0.1	v 2.6	d 0.0

STARS

Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 39.3	S40 24.0
Achernar	335 47.6	S57 21.3
Acrux	173 39.1	S62 58.5
Adhara	255 33.9	S28 56.8
Aldebaran	291 20.8	N16 27.7
Alioth	166 44.1	N56 04.8
Alkaid	153 20.0	N49 25.4
Al Na'ir	28 18.3	S47 04.2
Alnilam	276 14.1	S 1 13.2
Alphard	218 22.6	S 8 33.8
Alphecca	126 33.9	N26 47.3
Alpheratz	358 12.1	N28 57.8
Altair	62 35.0	N 8 48.4
Ankaa	353 43.0	S42 25.9
Antares	112 59.6	S26 22.9
Arcturus	146 20.3	N19 17.9
Atria	108 25.8	S68 58.9
Avior	234 28.8	S59 26.6
Bellatrix	279 01.3	N 6 19.6
Betelgeuse	271 30.8	N 7 24.0
Canopus	264 08.2	S52 41.4
Capella	281 14.9	N45 58.6
Deneb	49 50.3	N45 11.8
Denebola	183 01.1	N14 41.8
Diphda	349 23.6	S18 06.8
Dubhe	194 24.5	N61 52.4
Elnath	278 47.2	N28 35.3
Eltanin	90 58.8	N51 29.3
Enif	34 14.1	N 9 46.1
Fomalhaut	15 54.4	S29 44.6
Gacrux	172 30.7	S56 59.2
Gienah	176 20.0	S17 25.1
Hadar	149 26.1	S60 15.7
Hamal	328 31.8	N23 21.2
Kaus Aust.	84 20.0	S34 23.6
Kochab	137 18.2	N74 14.7
Markab	14 05.8	N15 04.9
Menkar	314 43.8	N 3 59.9
Menkent	148 39.4	S36 15.5
Miaplacidus	221 44.7	S69 37.8
Mirfak	309 19.7	N49 46.9
Nunki	76 32.2	S26 19.4
Peacock	54 02.5	S56 48.3
Pollux	244 00.9	N28 04.8
Procyon	245 28.1	N 5 16.8
Rasalhague	96 31.7	N12 34.5
Regulus	208 12.2	N12 04.5
Rigel	281 38.3	S 8 13.9
Rigil Kent.	140 28.4	S60 44.3
Sabik	102 43.7	S15 41.8
Schedar	350 12.2	N56 24.8
Shaula	96 58.9	S37 05.1
Sirius	258 57.7	S16 41.4
Spica	158 59.7	S11 02.7
Suhail	223 12.2	S43 20.8
Vega	80 57.5	N38 45.5
Zuben'ubi	137 35.4	S15 56.9

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	340 38.6	13 21
Mars	26 48.8	10 19
Jupiter	304 39.3	15 46
Saturn	226 54.8	20 55

G.M.T.	SUN G.H.A.	SUN Dec.	MOON G.H.A.	MOON *v*	MOON Dec.	MOON *d*	MOON H.P.
d h	° ′	° ′	° ′	′	° ′	′	′
20 00	178 05.2	S 0 17.5	176 28.9	13.8	N 2 35.6	10.0	55.5
01	193 05.4	16.5	191 01.7	13.8	2 45.6	9.9	55.5
02	208 05.5	15.5	205 34.5	13.7	2 55.5	10.0	55.5
03	223 05.7	·· 14.5	220 07.2	13.8	3 05.5	9.9	55.4
04	238 05.9	13.5	234 40.0	13.9	3 15.4	9.9	55.4
05	253 06.1	12.6	249 12.9	13.8	3 25.3	9.9	55.4
06	268 06.3	S 0 11.6	263 45.7	13.8	N 3 35.2	9.8	55.4
07	283 06.5	10.6	278 18.5	13.9	3 45.0	9.9	55.4
08	298 06.7	09.6	292 51.4	13.8	3 54.9	9.8	55.3
S 09	313 06.8	·· 08.6	307 24.2	13.9	4 04.7	9.8	55.3
U 10	328 07.0	07.6	321 57.1	13.9	4 14.5	9.7	55.3
N 11	343 07.2	06.6	336 30.0	13.8	4 24.2	9.8	55.3
D 12	358 07.4	S 0 05.6	351 02.8	13.9	N 4 34.0	9.7	55.3
A 13	13 07.6	04.6	5 35.7	13.9	4 43.7	9.6	55.3
Y 14	28 07.8	03.7	20 08.6	13.9	4 53.3	9.7	55.2
15	43 08.0	·· 02.7	34 41.5	13.9	5 03.0	9.6	55.2
16	58 08.1	01.7	49 14.4	13.9	5 12.6	9.6	55.2
17	73 08.3	S 0 00.7	63 47.3	13.9	5 22.2	9.6	55.2
18	88 08.5	N 0 00.3	78 20.2	13.9	N 5 31.8	9.5	55.2
19	103 08.7	01.3	92 53.1	13.9	5 41.3	9.5	55.1
20	118 08.9	02.3	107 26.0	14.0	5 50.8	9.4	55.1
21	133 09.1	·· 03.3	121 59.0	13.9	6 00.2	9.5	55.1
22	148 09.3	04.2	136 31.9	13.9	6 09.7	9.4	55.1
23	163 09.4	05.2	151 04.8	13.9	6 19.1	9.3	55.1
21 00	178 09.6	N 0 06.2	165 37.7	14.0	N 6 28.4	9.4	55.1
01	193 09.8	07.2	180 10.7	13.9	6 37.8	9.3	55.0
02	208 10.0	08.2	194 43.6	13.9	6 47.1	9.2	55.0
03	223 10.2	·· 09.2	209 16.5	14.0	6 56.3	9.2	55.0
04	238 10.4	10.2	223 49.5	13.9	7 05.5	9.2	55.0
05	253 10.6	11.2	238 22.4	13.9	7 14.7	9.2	55.0
06	268 10.7	N 0 12.1	252 55.3	13.9	N 7 23.9	9.1	55.0
07	283 10.9	13.1	267 28.2	14.0	7 33.0	9.0	54.9
08	298 11.1	14.1	282 01.2	13.9	7 42.0	9.1	54.9
M 09	313 11.3	·· 15.1	296 34.1	13.9	7 51.1	9.0	54.9
O 10	328 11.5	16.1	311 07.0	13.9	8 00.1	8.9	54.9
N 11	343 11.7	17.1	325 39.9	14.0	8 09.0	8.9	54.9
D 12	358 11.9	N 0 18.1	340 12.9	13.9	N 8 17.9	8.9	54.9
A 13	13 12.0	19.1	354 45.8	13.9	8 26.8	8.8	54.8
Y 14	28 12.2	20.0	9 18.7	13.9	8 35.6	8.8	54.8
15	43 12.4	·· 21.0	23 51.6	13.9	8 44.4	8.7	54.8
16	58 12.6	22.0	38 24.5	13.9	8 53.1	8.7	54.8
17	73 12.8	23.0	52 57.4	13.9	9 01.8	8.6	54.8
18	88 13.0	N 0 24.0	67 30.3	13.8	N 9 10.4	8.6	54.8
19	103 13.2	25.0	82 03.1	13.9	9 19.0	8.6	54.8
20	118 13.4	26.0	96 36.0	13.9	9 27.6	8.5	54.7
21	133 13.5	·· 27.0	111 08.9	13.9	9 36.1	8.5	54.7
22	148 13.7	27.9	125 41.8	13.8	9 44.6	8.4	54.7
23	163 13.9	28.9	140 14.6	13.9	9 53.0	8.3	54.7
22 00	178 14.1	N 0 29.9	154 47.5	13.8	N10 01.3	8.3	54.7
01	193 14.3	30.9	169 20.3	13.8	10 09.6	8.3	54.7
02	208 14.5	31.9	183 53.1	13.9	10 17.9	8.2	54.7
03	223 14.7	·· 32.9	198 26.0	13.8	10 26.1	8.2	54.6
04	238 14.8	33.9	212 58.8	13.8	10 34.3	8.1	54.6
05	253 15.0	34.9	227 31.6	13.8	10 42.4	8.1	54.6
06	268 15.2	N 0 35.8	242 04.4	13.8	N10 50.5	8.0	54.6
07	283 15.4	36.8	256 37.2	13.7	10 58.5	7.9	54.6
T 08	298 15.6	37.8	271 09.9	13.8	11 06.4	7.9	54.6
U 09	313 15.8	·· 38.8	285 42.7	13.8	11 14.3	7.9	54.6
E 10	328 16.0	39.8	300 15.5	13.7	11 22.2	7.8	54.5
S 11	343 16.2	40.8	314 48.2	13.7	11 30.0	7.7	54.5
D 12	358 16.3	N 0 41.8	329 20.9	13.8	N11 37.7	7.7	54.5
A 13	13 16.5	42.8	343 53.7	13.7	11 45.4	7.6	54.5
Y 14	28 16.7	43.7	358 26.4	13.7	11 53.0	7.6	54.5
15	43 16.9	·· 44.7	12 59.1	13.7	12 00.6	7.5	54.5
16	58 17.1	45.7	27 31.8	13.6	12 08.1	7.5	54.5
17	73 17.3	46.7	42 04.4	13.7	12 15.6	7.4	54.5
18	88 17.5	N 0 47.7	56 37.1	13.6	N12 23.0	7.3	54.4
19	103 17.7	48.7	71 09.7	13.7	12 30.3	7.3	54.4
20	118 17.8	49.7	85 42.4	13.6	12 37.6	7.3	54.4
21	133 18.0	·· 50.6	100 15.0	13.6	12 44.9	7.1	54.4
22	148 18.2	51.6	114 47.6	13.6	12 52.0	7.1	54.4
23	163 18.4	52.6	129 20.2	13.6	12 59.1	7.1	54.4
	S.D. 16.1	*d* 1.0	S.D. 15.1		14.9		14.9

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 20	Moonrise 21	Moonrise 22	Moonrise 23
°	h m	h m	h m	h m	h m	h m	h m
N 72	03 16	04 46	05 54	05 42	05 36	05 29	05 21
N 70	03 35	04 54	05 55	05 47	05 46	05 46	05 47
68	03 50	05 01	05 56	05 50	05 54	06 00	06 07
66	04 03	05 06	05 57	05 54	06 02	06 11	06 23
64	04 12	05 11	05 58	05 56	06 08	06 20	06 36
62	04 21	05 14	05 59	05 59	06 13	06 28	06 47
60	04 28	05 18	05 59	06 01	06 17	06 36	06 57
N 58	04 34	05 21	06 00	06 03	06 21	06 42	07 05
56	04 39	05 23	06 00	06 04	06 25	06 47	07 12
54	04 43	05 25	06 01	06 06	06 28	06 52	07 19
52	04 47	05 27	06 01	06 07	06 31	06 57	07 25
50	04 51	05 29	06 01	06 09	06 34	07 01	07 30
45	04 58	05 33	06 02	06 11	06 40	07 10	07 42
N 40	05 04	05 35	06 02	06 14	06 45	07 17	07 51
35	05 08	05 37	06 03	06 16	06 49	07 23	07 59
30	05 11	05 39	06 03	06 18	06 53	07 29	08 07
20	05 16	05 41	06 03	06 21	06 59	07 39	08 19
N 10	05 18	05 43	06 04	06 24	07 05	07 47	08 30
0	05 19	05 43	06 04	06 26	07 11	07 56	08 41
S 10	05 19	05 43	06 04	06 29	07 16	08 04	08 51
20	05 16	05 42	06 04	06 32	07 22	08 13	09 02
30	05 12	05 40	06 04	06 35	07 29	08 23	09 15
35	05 09	05 39	06 04	06 37	07 33	08 28	09 23
40	05 05	05 37	06 04	06 39	07 38	08 35	09 31
45	05 00	05 34	06 03	06 42	07 43	08 43	09 41
S 50	04 53	05 31	06 03	06 45	07 49	08 52	09 53
52	04 49	05 29	06 03	06 46	07 52	08 57	09 59
54	04 46	05 27	06 03	06 48	07 55	09 01	10 05
56	04 41	05 25	06 03	06 49	07 59	09 07	10 12
58	04 36	05 23	06 02	06 51	08 03	09 13	10 20
S 60	04 30	05 20	06 02	06 53	08 07	09 19	10 29

Lat.	Sunset	Twilight Civil	Twilight Naut.	Moonset 20	Moonset 21	Moonset 22	Moonset 23
°	h m	h m	h m	h m	h m	h m	h m
N 72	18 23	19 32	21 04	20 03	21 42	23 23	25 08
N 70	18 21	19 23	20 43	19 54	21 26	22 58	24 29
68	18 20	19 16	20 27	19 47	21 14	22 39	24 02
66	18 19	19 11	20 15	19 41	21 04	22 24	23 42
64	18 18	19 06	20 04	19 37	20 55	22 12	23 26
62	18 17	19 02	19 56	19 32	20 48	22 02	23 12
60	18 17	18 58	19 49	19 29	20 42	21 53	23 01
N 58	18 16	18 55	19 43	19 26	20 36	21 45	22 51
56	18 15	18 53	19 37	19 23	20 31	21 38	22 43
54	18 15	18 50	19 32	19 20	20 27	21 32	22 35
52	18 15	18 48	19 28	19 18	20 23	21 27	22 28
50	18 14	18 47	19 25	19 16	20 20	21 22	22 22
45	18 13	18 43	19 17	19 11	20 12	21 11	22 09
N 40	18 13	18 40	19 12	19 07	20 05	21 02	21 58
35	18 12	18 38	19 07	19 04	20 00	20 55	21 49
30	18 12	18 36	19 04	19 01	19 55	20 48	21 40
20	18 11	18 33	18 59	18 56	19 47	20 37	21 26
N 10	18 11	18 32	18 56	18 52	19 39	20 27	21 14
0	18 10	18 31	18 55	18 48	19 32	20 17	21 03
S 10	18 10	18 31	18 56	18 44	19 25	20 08	20 51
20	18 10	18 32	18 58	18 39	19 18	19 58	20 39
30	18 10	18 34	19 02	18 34	19 10	19 47	20 25
35	18 10	18 35	19 05	18 31	19 05	19 40	20 17
40	18 10	18 37	19 09	18 28	19 00	19 33	20 08
45	18 10	18 39	19 14	18 24	18 53	19 24	19 57
S 50	18 10	18 43	19 20	18 20	18 46	19 14	19 45
52	18 10	18 44	19 24	18 18	18 42	19 09	19 39
54	18 11	18 46	19 27	18 16	18 39	19 04	19 32
56	18 11	18 48	19 32	18 13	18 34	18 58	19 25
58	18 11	18 50	19 37	18 10	18 30	18 51	19 16
S 60	18 11	18 52	19 42	18 07	18 24	18 44	19 07

Day	SUN Eqn. of Time 00ʰ	SUN Eqn. of Time 12ʰ	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
	m s	m s	h m	h m	h m	d	
20	07 40	07 31	12 08	12 37	00 15	01	●
21	07 22	07 13	12 07	13 22	00 59	02	
22	07 04	06 55	12 07	14 06	01 44	03	

1977 MARCH 23, 24, 25 (WED., THURS., FRI.)

G.M.T.		ARIES	VENUS −3.8		MARS +1.4		JUPITER −1.7		SATURN +0.3	
		G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
d	h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
23	00	180 22.2	161 32.3	N16 24.4	205 41.3	S11 46.1	124 39.7	N19 02.6	47 21.3	N18 37.2
	01	195 24.6	176 35.5	24.3	220 41.9	45.4	139 41.7	02.7	62 23.9	37.2
	02	210 27.1	191 38.7	24.2	235 42.5	44.7	154 43.7	02.8	77 26.4	37.2
	03	225 29.5	206 41.9	· · 24.1	250 43.1	· · 44.0	169 45.7	· · 02.9	92 29.0	· · 37.2
	04	240 32.0	221 45.2	24.0	265 43.7	43.3	184 47.7	03.0	107 31.5	37.3
	05	255 34.5	236 48.4	23.8	280 44.3	42.6	199 49.7	03.1	122 34.1	37.3
	06	270 36.9	251 51.6	N16 23.7	295 44.9	S11 41.9	214 51.7	N19 03.2	137 36.6	N18 37.3
W	07	285 39.4	266 54.8	23.6	310 45.5	41.2	229 53.7	03.3	152 39.2	37.3
E	08	300 41.9	281 58.1	23.5	325 46.1	40.5	244 55.7	03.4	167 41.7	37.4
D	09	315 44.3	297 01.3	· · 23.4	340 46.8	· · 39.8	259 57.7	· · 03.6	182 44.3	· · 37.4
N	10	330 46.8	312 04.6	23.2	355 47.4	39.1	274 59.7	03.7	197 46.8	37.4
E	11	345 49.3	327 07.8	23.1	10 48.0	38.4	290 01.7	03.8	212 49.4	37.4
S	12	0 51.7	342 11.1	N16 23.0	25 48.6	S11 37.7	305 03.7	N19 03.9	227 51.9	N18 37.4
D	13	15 54.2	357 14.3	22.8	40 49.2	37.0	320 05.7	04.0	242 54.5	37.5
A	14	30 56.6	12 17.6	22.7	55 49.8	36.3	335 07.7	04.1	257 57.0	37.5
Y	15	45 59.1	27 20.8	· · 22.5	70 50.4	· · 35.6	350 09.8	· · 04.2	272 59.6	· · 37.5
	16	61 01.6	42 24.1	22.4	85 51.0	34.9	5 11.8	04.3	288 02.1	37.5
	17	76 04.0	57 27.4	22.3	100 51.6	34.2	20 13.8	04.4	303 04.7	37.6
	18	91 06.5	72 30.6	N16 22.1	115 52.2	S11 33.5	35 15.8	N19 04.5	318 07.2	N18 37.6
	19	106 09.0	87 33.9	21.9	130 52.8	32.8	50 17.8	04.6	333 09.8	37.6
	20	121 11.4	102 37.2	21.8	145 53.4	32.1	65 19.8	04.7	348 12.3	37.6
	21	136 13.9	117 40.5	· · 21.6	160 54.0	· · 31.5	80 21.8	· · 04.8	3 14.9	· · 37.7
	22	151 16.4	132 43.7	21.5	175 54.6	30.8	95 23.8	05.0	18 17.4	37.7
	23	166 18.8	147 47.0	21.3	190 55.2	30.1	110 25.8	05.1	33 20.0	37.7
24	00	181 21.3	162 50.3	N16 21.2	205 55.8	S11 29.4	125 27.8	N19 05.2	48 22.5	N18 37.7
	01	196 23.8	177 53.6	21.0	220 56.4	28.7	140 29.8	05.3	63 25.0	37.7
	02	211 26.2	192 56.9	20.8	235 57.0	28.0	155 31.8	05.4	78 27.6	37.8
	03	226 28.7	208 00.2	· · 20.6	250 57.6	· · 27.3	170 33.8	· · 05.5	93 30.1	· · 37.8
	04	241 31.1	223 03.5	20.5	265 58.2	26.6	185 35.8	05.6	108 32.7	37.8
	05	256 33.6	238 06.8	20.3	280 58.8	25.9	200 37.8	05.7	123 35.2	37.8
	06	271 36.1	253 10.2	N16 20.1	295 59.5	S11 25.2	215 39.8	N19 05.8	138 37.8	N18 37.9
	07	286 38.5	268 13.5	19.9	311 00.1	24.5	230 41.8	05.9	153 40.3	37.9
T	08	301 41.0	283 16.8	19.7	326 00.7	23.8	245 43.8	06.0	168 42.9	37.9
H	09	316 43.5	298 20.1	· · 19.5	341 01.3	· · 23.1	260 45.8	· · 06.1	183 45.4	· · 37.9
U	10	331 45.9	313 23.4	19.4	356 01.9	22.4	275 47.8	06.3	198 48.0	37.9
R	11	346 48.4	328 26.8	19.2	11 02.5	21.7	290 49.8	06.4	213 50.5	38.0
S	12	1 50.9	343 30.1	N16 19.0	26 03.1	S11 21.0	305 51.8	N19 06.5	228 53.1	N18 38.0
D	13	16 53.3	358 33.4	18.8	41 03.7	20.3	320 53.8	06.6	243 55.6	38.0
A	14	31 55.8	13 36.8	18.6	56 04.3	19.6	335 55.8	06.7	258 58.1	38.0
Y	15	46 58.3	28 40.1	· · 18.4	71 04.9	· · 18.8	350 57.8	· · 06.8	274 00.7	· · 38.1
	16	62 00.7	43 43.5	18.1	86 05.5	18.1	5 59.8	06.9	289 03.2	38.1
	17	77 03.2	58 46.8	17.9	101 06.1	17.4	21 01.8	07.0	304 05.8	38.1
	18	92 05.6	73 50.2	N16 17.7	116 06.8	S11 16.7	36 03.8	N19 07.1	319 08.3	N18 38.1
	19	107 08.1	88 53.5	17.5	131 07.4	16.0	51 05.8	07.2	334 10.9	38.1
	20	122 10.6	103 56.9	17.3	146 08.0	15.3	66 07.8	07.3	349 13.4	38.2
	21	137 13.0	119 00.2	· · 17.1	161 08.6	· · 14.6	81 09.8	· · 07.4	4 15.9	· · 38.2
	22	152 15.5	134 03.6	16.8	176 09.2	13.9	96 11.8	07.5	19 18.5	38.2
	23	167 18.0	149 07.0	16.6	191 09.8	13.2	111 13.8	07.7	34 21.0	38.2
25	00	182 20.4	164 10.4	N16 16.4	206 10.4	S11 12.5	126 15.8	N19 07.8	49 23.6	N18 38.2
	01	197 22.9	179 13.7	16.2	221 11.0	11.8	141 17.8	07.9	64 26.1	38.2
	02	212 25.4	194 17.1	15.9	236 11.6	11.1	156 19.8	08.0	79 28.6	38.3
	03	227 27.8	209 20.5	· · 15.7	251 12.2	· · 10.4	171 21.8	· · 08.1	94 31.2	· · 38.3
	04	242 30.3	224 23.9	15.5	266 12.8	09.7	186 23.8	08.2	109 33.7	38.3
	05	257 32.7	239 27.3	15.2	281 13.4	09.0	201 25.7	08.3	124 36.3	38.3
	06	272 35.2	254 30.7	N16 15.0	296 14.1	S11 08.3	216 27.7	N19 08.4	139 38.8	N18 38.3
	07	287 37.7	269 34.1	14.7	311 14.7	07.6	231 29.7	08.5	154 41.3	38.4
	08	302 40.1	284 37.4	14.5	326 15.3	06.9	246 31.7	08.6	169 43.9	38.4
F	09	317 42.6	299 40.8	· · 14.3	341 15.9	· · 06.2	261 33.7	· · 08.7	184 46.4	· · 38.4
R	10	332 45.1	314 44.3	14.0	356 16.5	05.5	276 35.7	08.8	199 49.0	38.4
I	11	347 47.5	329 47.7	13.7	11 17.1	04.8	291 37.7	09.0	214 51.5	38.4
D	12	2 50.0	344 51.1	N16 13.5	26 17.7	S11 04.1	306 39.7	N19 09.1	229 54.0	N18 38.5
A	13	17 52.5	359 54.5	13.2	41 18.3	03.4	321 41.7	09.2	244 56.6	38.5
Y	14	32 54.9	14 57.9	13.0	56 18.9	02.7	336 43.7	09.3	259 59.1	38.5
	15	47 57.4	30 01.3	· · 12.7	71 19.5	· · 02.0	351 45.7	· · 09.4	275 01.7	· · 38.5
	16	62 59.9	45 04.8	12.4	86 20.1	01.3	6 47.7	09.5	290 04.2	38.5
	17	78 02.3	60 08.2	12.2	101 20.8	11 00.6	21 49.7	09.6	305 06.7	38.6
	18	93 04.8	75 11.6	N16 11.9	116 21.4	S10 59.9	36 51.7	N19 09.7	320 09.3	N18 38.6
	19	108 07.2	90 15.0	11.6	131 22.0	59.1	51 53.7	09.8	335 11.8	38.6
	20	123 09.7	105 18.5	11.3	146 22.6	58.4	66 55.7	09.9	350 14.4	38.6
	21	138 12.2	120 21.9	· · 11.0	161 23.2	· · 57.7	81 57.7	· · 10.0	5 16.9	· · 38.6
	22	153 14.6	135 25.4	10.8	176 23.8	57.0	96 59.7	10.1	20 19.4	38.7
	23	168 17.1	150 28.8	10.5	191 24.4	56.3	112 01.7	10.3	35 22.0	38.7
Mer. Pass.		h m 11 52.6	v 3.3	d 0.2	v 0.6	d 0.7	v 2.0	d 0.1	v 2.5	d 0.0

STARS

Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 39.4	S40 24.0
Achernar	335 47.6	S57 21.3
Acrux	173 39.1	S62 58.5
Adhara	255 33.9	S28 56.8
Aldebaran	291 20.8	N16 27.7
Alioth	166 44.1	N56 04.9
Alkaid	153 20.0	N49 25.4
Al Na'ir	28 18.3	S47 04.2
Alnilam	276 14.1	S 1 13.2
Alphard	218 22.6	S 8 33.8
Alphecca	126 33.9	N26 47.3
Alpheratz	358 12.1	N28 57.8
Altair	62 34.9	N 8 48.4
Ankaa	353 43.0	S42 25.9
Antares	112 59.6	S26 22.9
Arcturus	146 20.3	N19 17.9
Atria	108 25.7	S68 58.9
Avior	234 28.8	S59 26.6
Bellatrix	279 01.3	N 6 19.6
Betelgeuse	271 30.8	N 7 24.0
Canopus	264 08.2	S52 41.4
Capella	281 14.9	N45 58.6
Deneb	49 50.3	N45 11.8
Denebola	183 01.1	N14 41.8
Diphda	349 23.6	S18 06.8
Dubhe	194 24.5	N61 52.4
Elnath	278 47.2	N28 35.3
Eltanin	90 58.8	N51 29.3
Enif	34 14.1	N 9 46.1
Fomalhaut	15 54.4	S29 44.6
Gacrux	172 30.7	S56 59.2
Gienah	176 20.0	S17 25.1
Hadar	149 26.0	S60 15.8
Hamal	328 31.9	N23 21.2
Kaus Aust.	84 20.0	S34 23.6
Kochab	137 18.1	N74 14.7
Markab	14 05.8	N15 04.9
Menkar	314 43.8	N 3 59.9
Menkent	148 39.4	S36 15.5
Miaplacidus	221 44.7	S69 37.8
Mirfak	309 19.8	N49 46.9
Nunki	76 32.1	S26 19.4
Peacock	54 02.4	S56 48.3
Pollux	244 00.9	N28 04.8
Procyon	245 28.1	N 5 16.8
Rasalhague	96 31.7	N12 34.5
Regulus	208 12.2	N12 04.5
Rigel	281 38.4	S 8 13.9
Rigil Kent.	140 28.4	S60 44.3
Sabik	102 43.7	S15 41.8
Schedar	350 12.2	N56 24.7
Shaula	96 58.9	S37 05.1
Sirius	258 57.7	S16 41.4
Spica	158 59.7	S11 02.7
Suhail	223 12.2	S43 20.8
Vega	80 57.5	N38 45.5
Zuben'ubi	137 35.4	S15 56.9

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	341 29.0	13 06
Mars	24 34.5	10 16
Jupiter	304 06.5	15 36
Saturn	227 01.2	20 43

1977 MARCH 23, 24, 25 (WED., THURS., FRI.)

G.M.T.		SUN G.H.A.	SUN Dec.	MOON G.H.A.	v	MOON Dec.	d	H.P.
d h		° ′	° ′	° ′	′	° ′	′	′
23 00		178 18.6	N 0 53.6	143 52.8	13.5	N13 06.2	7.0	54.4
01		193 18.8	54.6	158 25.3	13.6	13 13.2	6.9	54.4
02		208 19.0	55.6	172 57.9	13.5	13 20.1	6.9	54.4
03		223 19.2	· · 56.6	187 30.4	13.5	13 27.0	6.8	54.3
04		238 19.4	57.5	202 02.9	13.5	13 33.8	6.7	54.3
05		253 19.5	58.5	216 35.4	13.5	13 40.5	6.7	54.3
06		268 19.7	N 0 59.5	231 07.9	13.5	N13 47.2	6.6	54.3
07	W	283 19.9	1 00.5	245 40.4	13.4	13 53.8	6.6	54.3
08	E	298 20.1	01.5	260 12.8	13.5	14 00.4	6.4	54.3
09	D	313 20.3	· · 02.5	274 45.3	13.4	14 06.8	6.5	54.3
10	N	328 20.5	03.5	289 17.7	13.4	14 13.3	6.3	54.3
11	E	343 20.7	04.4	303 50.1	13.4	14 19.6	6.3	54.3
12	S	358 20.9	N 1 05.4	318 22.5	13.4	N14 25.9	6.2	54.3
13	D	13 21.0	06.4	332 54.9	13.3	14 32.1	6.2	54.3
14	A	28 21.2	07.4	347 27.2	13.4	14 38.3	6.1	54.3
15	Y	43 21.4	· · 08.4	1 59.6	13.3	14 44.4	6.0	54.2
16		58 21.6	09.4	16 31.9	13.3	14 50.4	6.0	54.2
17		73 21.8	10.4	31 04.2	13.3	14 56.4	5.8	54.2
18		88 22.0	N 1 11.3	45 36.5	13.3	N15 02.2	5.9	54.2
19		103 22.2	12.3	60 08.8	13.2	15 08.1	5.7	54.2
20		118 22.4	13.3	74 41.0	13.3	15 13.8	5.7	54.2
21		133 22.5	· · 14.3	89 13.3	13.2	15 19.5	5.6	54.2
22		148 22.7	15.3	103 45.5	13.2	15 25.1	5.5	54.2
23		163 22.9	16.3	118 17.7	13.2	15 30.6	5.5	54.2
24 00		178 23.1	N 1 17.2	132 49.9	13.1	N15 36.1	5.4	54.2
01		193 23.3	18.2	147 22.0	13.2	15 41.5	5.3	54.2
02		208 23.5	19.2	161 54.2	13.1	15 46.8	5.3	54.2
03		223 23.7	· · 20.2	176 26.3	13.1	15 52.1	5.2	54.2
04		238 23.9	21.2	190 58.4	13.1	15 57.3	5.1	54.2
05		253 24.1	22.2	205 30.5	13.1	16 02.4	5.0	54.2
06		268 24.2	N 1 23.2	220 02.6	13.0	N16 07.4	5.0	54.2
07		283 24.4	24.1	234 34.6	13.1	16 12.4	4.9	54.2
08	T	298 24.6	25.1	249 06.7	13.0	16 17.3	4.8	54.2
09	H	313 24.8	· · 26.1	263 38.7	13.0	16 22.1	4.8	54.2
10	U	328 25.0	27.1	278 10.7	13.0	16 26.9	4.6	54.1
11	R	343 25.2	28.1	292 42.7	12.9	16 31.5	4.6	54.1
12	S	358 25.4	N 1 29.1	307 14.6	13.0	N16 36.1	4.5	54.1
13	D	13 25.6	30.0	321 46.6	12.9	16 40.6	4.5	54.1
14	A	28 25.7	31.0	336 18.5	12.9	16 45.1	4.4	54.1
15	Y	43 25.9	· · 32.0	350 50.4	12.9	16 49.5	4.3	54.1
16		58 26.1	33.0	5 22.3	12.9	16 53.8	4.2	54.1
17		73 26.3	34.0	19 54.2	12.8	16 58.0	4.1	54.1
18		88 26.5	N 1 35.0	34 26.0	12.8	N17 02.1	4.1	54.1
19		103 26.7	35.9	48 57.8	12.9	17 06.2	4.0	54.1
20		118 26.9	36.9	63 29.7	12.8	17 10.2	3.9	54.1
21		133 27.1	· · 37.9	78 01.5	12.7	17 14.1	3.8	54.1
22		148 27.2	38.9	92 33.2	12.8	17 17.9	3.8	54.1
23		163 27.4	39.9	107 05.0	12.7	17 21.7	3.6	54.1
25 00		178 27.6	N 1 40.9	121 36.7	12.7	N17 25.3	3.6	54.1
01		193 27.8	41.8	136 08.4	12.7	17 28.9	3.5	54.1
02		208 28.0	42.8	150 40.1	12.7	17 32.4	3.5	54.1
03		223 28.2	· · 43.8	165 11.8	12.7	17 35.9	3.3	54.1
04		238 28.4	44.8	179 43.5	12.6	17 39.2	3.3	54.1
05		253 28.6	45.8	194 15.1	12.7	17 42.5	3.2	54.1
06		268 28.8	N 1 46.8	208 46.8	12.6	N17 45.7	3.1	54.1
07		283 29.0	47.7	223 18.4	12.6	17 48.8	3.1	54.1
08		298 29.2	48.7	237 50.0	12.5	17 51.9	2.9	54.1
09	F	313 29.3	· · 49.7	252 21.5	12.6	17 54.8	2.9	54.1
10	R	328 29.5	50.7	266 53.1	12.5	17 57.7	2.8	54.1
11	I	343 29.7	51.7	281 24.6	12.5	18 00.5	2.7	54.2
12	D	358 29.9	N 1 52.6	295 56.1	12.6	N18 03.2	2.6	54.2
13	A	13 30.1	53.6	310 27.7	12.4	18 05.8	2.6	54.2
14	Y	28 30.3	54.6	324 59.1	12.5	18 08.4	2.4	54.2
15		43 30.5	· · 55.6	339 30.6	12.4	18 10.8	2.4	54.2
16		58 30.7	56.6	354 02.0	12.5	18 13.2	2.3	54.2
17		73 30.9	57.6	8 33.5	12.4	18 15.5	2.2	54.2
18		88 31.0	N 1 58.5	23 04.9	12.4	N18 17.7	2.2	54.2
19		103 31.2	1 59.5	37 36.3	12.4	18 19.9	2.0	54.2
20		118 31.4	2 00.5	52 07.7	12.3	18 21.9	2.0	54.2
21		133 31.6	· · 01.5	66 39.0	12.4	18 23.9	1.9	54.2
22		148 31.8	02.5	81 10.4	12.3	18 25.8	1.8	54.2
23		163 32.0	03.5	95 41.7	12.3	18 27.6	1.7	54.2
		S.D. 16.1	d 1.0	S.D. 14.8		14.8		14.8

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 23	Moonrise 24	Moonrise 25	Moonrise 26
°	h m	h m	h m	h m	h m	h m	h m
N 72	02 54	04 29	05 39	05 21	05 12	04 52	▭
N 70	03 17	04 39	05 41	05 47	05 51	06 01	06 23
68	03 35	04 47	05 44	06 07	06 19	06 37	07 08
66	03 49	04 54	05 46	06 23	06 40	07 03	07 38
64	04 00	05 00	05 47	06 36	06 56	07 24	08 00
62	04 10	05 04	05 49	06 47	07 10	07 40	08 18
60	04 18	05 08	05 50	06 57	07 22	07 54	08 33
N 58	04 24	05 12	05 51	07 05	07 32	08 05	08 46
56	04 30	05 15	05 52	07 12	07 41	08 16	08 57
54	04 35	05 18	05 53	07 19	07 49	08 25	09 06
52	04 40	05 20	05 54	07 25	07 56	08 33	09 15
50	04 44	05 22	05 55	07 30	08 03	08 40	09 23
45	04 52	05 27	05 56	07 42	08 17	08 56	09 39
N 40	04 59	05 30	05 57	07 51	08 28	09 08	09 53
35	05 04	05 33	05 58	07 59	08 38	09 19	10 04
30	05 08	05 35	05 59	08 07	08 46	09 29	10 14
20	05 13	05 39	06 01	08 19	09 01	09 45	10 31
N 10	05 17	05 41	06 02	08 30	09 14	10 00	10 47
0	05 18	05 42	06 03	08 41	09 27	10 13	11 01
S 10	05 19	05 43	06 04	08 51	09 39	10 27	11 15
20	05 17	05 43	06 05	09 02	09 52	10 41	11 30
30	05 14	05 42	06 06	09 15	10 07	10 58	11 47
35	05 12	05 41	06 06	09 23	10 16	11 08	11 57
40	05 08	05 40	06 07	09 31	10 26	11 19	12 09
45	05 04	05 38	06 07	09 41	10 38	11 32	12 23
S 50	04 58	05 36	06 08	09 53	10 52	11 48	12 39
52	04 55	05 34	06 08	09 59	10 59	11 55	12 47
54	04 52	05 33	06 08	10 05	11 07	12 04	12 56
56	04 48	05 32	06 09	10 12	11 15	12 13	13 06
58	04 43	05 30	06 09	10 20	11 24	12 24	13 17
S 60	04 38	05 28	06 09	10 29	11 35	12 36	13 30

Lat.	Sunset	Twilight Civil	Twilight Naut.	Moonset 23	Moonset 24	Moonset 25	Moonset 26
°	h m	h m	h m	h m	h m	h m	h m
N 72	18 37	19 47	21 24	25 08	01 08	03 04	▭
N 70	18 34	19 36	21 00	24 29	00 29	01 56	03 12
68	18 31	19 28	20 41	24 02	00 02	01 20	02 27
66	18 29	19 21	20 27	23 42	24 54	00 54	01 57
64	18 27	19 15	20 15	23 26	24 34	00 34	01 35
62	18 25	19 10	20 05	23 12	24 18	00 18	01 17
60	18 24	19 06	19 57	23 01	24 05	00 05	01 02
N 58	18 23	19 02	19 50	22 51	23 53	24 49	00 49
56	18 22	18 59	19 44	22 43	23 43	24 39	00 39
54	18 21	18 56	19 39	22 35	23 34	24 29	00 29
52	18 20	18 54	19 34	22 28	23 26	24 21	00 21
50	18 19	18 51	19 30	22 22	23 19	24 13	00 13
45	18 17	18 47	19 21	22 09	23 04	23 57	24 46
N 40	18 16	18 43	19 15	21 58	22 52	23 43	24 32
35	18 15	18 40	19 10	21 49	22 41	23 32	24 20
30	18 14	18 38	19 06	21 40	22 32	23 22	24 10
20	18 12	18 34	19 00	21 26	22 16	23 05	23 53
N 10	18 11	18 32	18 56	21 14	22 02	22 50	23 38
0	18 10	18 30	18 54	21 03	21 49	22 36	23 24
S 10	18 09	18 29	18 54	20 51	21 36	22 22	23 10
20	18 07	18 29	18 55	20 39	21 22	22 07	22 54
30	18 06	18 30	18 58	20 25	21 06	21 50	22 37
35	18 06	18 31	19 00	20 17	20 57	21 40	22 27
40	18 05	18 32	19 04	20 08	20 47	21 29	22 15
45	18 05	18 34	19 08	19 57	20 34	21 16	22 02
S 50	18 04	18 36	19 14	19 45	20 19	20 59	21 45
52	18 04	18 37	19 17	19 39	20 12	20 52	21 37
54	18 03	18 38	19 20	19 32	20 05	20 43	21 28
56	18 03	18 40	19 23	19 25	19 56	20 34	21 18
58	18 02	18 41	19 28	19 16	19 46	20 23	21 07
S 60	18 02	18 43	19 32	19 07	19 35	20 10	20 54

Day	SUN Eqn. of Time 00ʰ	SUN Eqn. of Time 12ʰ	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	Age	Phase
	m s	m s	h m	h m	h m	d	
23	06 46	06 37	12 07	14 52	02 29	04	◐
24	06 28	06 19	12 06	15 38	03 15	05	
25	06 10	06 01	12 06	16 25	04 01	06	

1977 MARCH 26, 27, 28 (SAT., SUN., MON.)

G.M.T.		ARIES	VENUS −3.7		MARS +1.4		JUPITER −1.7		SATURN +0.3	
		G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
d	h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
26	00	183 19.6	165 32.3	N16 10.2	206 25.0	S10 55.6	127 03.7	N19 10.4	50 24.5	N18 38.7
	01	198 22.0	180 35.7	09.9	221 25.6	54.9	142 05.6	10.5	65 27.1	38.7
	02	213 24.5	195 39.2	09.6	236 26.3	54.2	157 07.6	10.6	80 29.6	38.7
	03	228 27.0	210 42.6	·· 09.3	251 26.9	·· 53.5	172 09.6	·· 10.7	95 32.1	·· 38.8
	04	243 29.4	225 46.1	09.0	266 27.5	52.8	187 11.6	10.8	110 34.7	38.8
	05	258 31.9	240 49.6	08.7	281 28.1	52.1	202 13.6	10.9	125 37.2	38.8
	06	273 34.4	255 53.0	N16 08.4	296 28.7	S10 51.4	217 15.6	N19 11.0	140 39.7	N18 38.8
	07	288 36.8	270 56.5	08.1	311 29.3	50.7	232 17.6	11.1	155 42.3	38.8
S	08	303 39.3	286 00.0	07.8	326 29.9	50.0	247 19.6	11.2	170 44.8	38.9
A	09	318 41.7	301 03.5	·· 07.4	341 30.6	·· 49.2	262 21.6	·· 11.3	185 47.3	·· 38.9
T	10	333 44.2	316 06.9	07.1	356 31.2	48.5	277 23.6	11.4	200 49.9	38.9
U	11	348 46.7	331 10.4	06.8	11 31.8	47.8	292 25.6	11.6	215 52.4	38.9
R	12	3 49.1	346 13.9	N16 06.5	26 32.4	S10 47.1	307 27.6	N19 11.7	230 55.0	N18 38.9
D	13	18 51.6	1 17.4	06.2	41 33.0	46.4	322 29.6	11.8	245 57.5	39.0
A	14	33 54.1	16 20.9	05.8	56 33.6	45.7	337 31.5	11.9	261 00.0	39.0
Y	15	48 56.5	31 24.4	·· 05.5	71 34.2	·· 45.0	352 33.5	·· 12.0	276 02.6	·· 39.0
	16	63 59.0	46 27.9	05.2	86 34.8	44.3	7 35.5	12.1	291 05.1	39.0
	17	79 01.5	61 31.4	04.8	101 35.5	43.6	22 37.5	12.2	306 07.6	39.0
	18	94 03.9	76 34.9	N16 04.5	116 36.1	S10 42.9	37 39.5	N19 12.3	321 10.2	N18 39.1
	19	109 06.4	91 38.4	04.2	131 36.7	42.1	52 41.5	12.4	336 12.7	39.1
	20	124 08.8	106 41.9	03.8	146 37.3	41.4	67 43.5	12.5	351 15.2	39.1
	21	139 11.3	121 45.4	·· 03.5	161 37.9	·· 40.7	82 45.5	·· 12.6	6 17.8	·· 39.1
	22	154 13.8	136 49.0	03.1	176 38.5	40.0	97 47.5	12.7	21 20.3	39.1
	23	169 16.2	151 52.5	02.8	191 39.2	39.3	112 49.5	12.9	36 22.8	39.2
27	00	184 18.7	166 56.0	N16 02.4	206 39.8	S10 38.6	127 51.4	N19 13.0	51 25.4	N18 39.2
	01	199 21.2	181 59.5	02.0	221 40.4	37.9	142 53.4	13.1	66 27.9	39.2
	02	214 23.6	197 03.1	01.7	236 41.0	37.2	157 55.4	13.2	81 30.4	39.2
	03	229 26.1	212 06.6	·· 01.3	251 41.6	·· 36.5	172 57.4	·· 13.3	96 33.0	·· 39.2
	04	244 28.6	227 10.1	01.0	266 42.2	35.7	187 59.4	13.4	111 35.5	39.2
	05	259 31.0	242 13.7	00.6	281 42.9	35.0	203 01.4	13.5	126 38.0	39.3
	06	274 33.5	257 17.2	N16 00.2	296 43.5	S10 34.3	218 03.4	N19 13.6	141 40.6	N18 39.3
	07	289 36.0	272 20.7	15 59.9	311 44.1	33.6	233 05.4	13.7	156 43.1	39.3
	08	304 38.4	287 24.3	59.5	326 44.7	32.9	248 07.3	13.8	171 45.6	39.3
S	09	319 40.9	302 27.8	·· 59.1	341 45.3	·· 32.2	263 09.3	·· 13.9	186 48.2	·· 39.3
U	10	334 43.3	317 31.4	58.7	356 45.9	31.5	278 11.3	14.0	201 50.7	39.4
N	11	349 45.8	332 34.9	58.3	11 46.6	30.8	293 13.3	14.2	216 53.2	39.4
D	12	4 48.3	347 38.5	N15 57.9	26 47.2	S10 30.0	308 15.3	N19 14.3	231 55.8	N18 39.4
A	13	19 50.7	2 42.1	57.6	41 47.8	29.3	323 17.3	14.4	246 58.3	39.4
Y	14	34 53.2	17 45.6	57.2	56 48.4	28.6	338 19.3	14.5	262 00.8	39.4
	15	49 55.7	32 49.2	·· 56.8	71 49.0	·· 27.9	353 21.3	·· 14.6	277 03.4	·· 39.4
	16	64 58.1	47 52.8	56.4	86 49.6	27.2	8 23.2	14.7	292 05.9	39.5
	17	80 00.6	62 56.3	56.0	101 50.3	26.5	23 25.2	14.8	307 08.4	39.5
	18	95 03.1	77 59.9	N15 55.6	116 50.9	S10 25.8	38 27.2	N19 14.9	322 10.9	N18 39.5
	19	110 05.5	93 03.5	55.2	131 51.5	25.0	53 29.2	15.0	337 13.5	39.5
	20	125 08.0	108 07.1	54.8	146 52.1	24.3	68 31.2	15.1	352 16.0	39.5
	21	140 10.5	123 10.6	·· 54.4	161 52.7	·· 23.6	83 33.2	·· 15.2	7 18.5	·· 39.6
	22	155 12.9	138 14.2	53.9	176 53.4	22.9	98 35.2	15.4	22 21.1	39.6
	23	170 15.4	153 17.8	53.5	191 54.0	22.2	113 37.1	15.5	37 23.6	39.6
28	00	185 17.8	168 21.4	N15 53.1	206 54.6	S10 21.5	128 39.1	N19 15.6	52 26.1	N18 39.6
	01	200 20.3	183 25.0	52.7	221 55.2	20.8	143 41.1	15.7	67 28.6	39.6
	02	215 22.8	198 28.6	52.3	236 55.8	20.0	158 43.1	15.8	82 31.2	39.6
	03	230 25.2	213 32.2	·· 51.8	251 56.5	·· 19.3	173 45.1	·· 15.9	97 33.7	·· 39.7
	04	245 27.7	228 35.8	51.4	266 57.1	18.6	188 47.1	16.0	112 36.2	39.7
	05	260 30.2	243 39.4	51.0	281 57.7	17.9	203 49.1	16.1	127 38.8	39.7
	06	275 32.6	258 43.0	N15 50.5	296 58.3	S10 17.2	218 51.0	N19 16.2	142 41.3	N18 39.7
	07	290 35.1	273 46.6	50.1	311 58.9	16.5	233 53.0	16.3	157 43.8	39.7
	08	305 37.6	288 50.2	49.7	326 59.6	15.7	248 55.0	16.4	172 46.3	39.7
M	09	320 40.0	303 53.8	·· 49.2	342 00.2	·· 15.0	263 57.0	·· 16.6	187 48.9	·· 39.8
O	10	335 42.5	318 57.4	48.8	357 00.8	14.3	278 59.0	16.7	202 51.4	39.8
N	11	350 44.9	334 01.1	48.3	12 01.4	13.6	294 01.0	16.8	217 53.9	39.8
D	12	5 47.4	349 04.7	N15 47.9	27 02.0	S10 12.9	309 02.9	N19 16.9	232 56.5	N18 39.8
A	13	20 49.9	4 08.3	47.4	42 02.7	12.2	324 04.9	17.0	247 59.0	39.8
Y	14	35 52.3	19 11.9	47.0	57 03.3	11.4	339 06.9	17.1	263 01.5	39.8
	15	50 54.8	34 15.6	·· 46.5	72 03.9	·· 10.7	354 08.9	·· 17.2	278 04.0	·· 39.9
	16	65 57.3	49 19.2	46.1	87 04.5	10.0	9 10.9	17.3	293 06.6	39.9
	17	80 59.7	64 22.8	45.6	102 05.2	09.3	24 12.8	17.4	308 09.1	39.9
	18	96 02.2	79 26.5	N15 45.1	117 05.8	S10 08.6	39 14.8	N19 17.5	323 11.6	N18 39.9
	19	111 04.7	94 30.1	44.7	132 06.4	07.9	54 16.8	17.6	338 14.1	39.9
	20	126 07.1	109 33.7	44.2	147 07.0	07.1	69 18.8	17.8	353 16.7	39.9
	21	141 09.6	124 37.4	·· 43.7	162 07.6	·· 06.4	84 20.8	·· 17.9	8 19.2	·· 40.0
	22	156 12.1	139 41.0	43.3	177 08.3	05.7	99 22.8	18.0	23 21.7	40.0
	23	171 14.5	154 44.7	42.8	192 08.9	05.0	114 24.7	18.1	38 24.2	40.0
Mer. Pass.		h m 11 40.8	v 3.6	d 0.4	v 0.6	d 0.7	v 2.0	d 0.1	v 2.5	d 0.0

STARS		
Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 39.4	S40 24.0
Achernar	335 47.6	S57 21.3
Acrux	173 39.1	S62 58.5
Adhara	255 33.9	S28 56.8
Aldebaran	291 20.8	N16 27.7
Alioth	166 44.1	N56 04.9
Alkaid	153 19.9	N49 25.4
Al Na'ir	28 18.3	S47 04.2
Alnilam	276 14.1	S 1 13.2
Alphard	218 22.6	S 8 33.8
Alphecca	126 33.9	N26 47.3
Alpheratz	358 12.1	N28 57.8
Altair	62 34.9	N 8 48.4
Ankaa	353 43.0	S42 25.8
Antares	112 59.5	S26 22.9
Arcturus	146 20.3	N19 17.9
Atria	108 25.7	S68 59.0
Avior	234 28.8	S59 26.6
Bellatrix	279 01.3	N 6 19.6
Betelgeuse	271 30.9	N 7 24.0
Canopus	264 08.2	S52 41.4
Capella	281 14.9	N45 58.6
Deneb	49 50.3	N45 11.8
Denebola	183 01.1	N14 41.8
Diphda	349 23.6	S18 06.8
Dubhe	194 24.5	N61 52.4
Elnath	278 47.2	N28 35.3
Eltanin	90 58.7	N51 29.3
Enif	34 14.1	N 9 46.1
Fomalhaut	15 54.4	S29 44.6
Gacrux	172 30.7	S56 59.3
Gienah	176 20.0	S17 25.1
Hadar	149 26.0	S60 15.8
Hamal	328 31.9	N23 21.2
Kaus Aust.	84 19.9	S34 23.6
Kochab	137 18.1	N74 14.8
Markab	14 05.8	N15 04.9
Menkar	314 43.8	N 3 59.9
Menkent	148 39.4	S36 15.5
Miaplacidus	221 44.8	S69 37.8
Mirfak	309 19.8	N49 46.9
Nunki	76 32.1	S26 19.4
Peacock	54 02.4	S56 48.3
Pollux	244 00.9	N28 04.8
Procyon	245 28.1	N 5 16.8
Rasalhague	96 31.7	N12 34.5
Regulus	208 12.2	N12 04.5
Rigel	281 38.4	S 8 13.9
Rigil Kent.	140 28.4	S60 44.3
Sabik	102 43.7	S15 41.8
Schedar	350 12.2	N56 24.7
Shaula	96 58.8	S37 05.1
Sirius	258 57.7	S16 41.4
Spica	158 59.7	S11 02.7
Suhail	223 12.2	S43 20.8
Vega	80 57.4	N38 45.5
Zuben'ubi	137 35.4	S15 56.9

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	342 37.3	12 49
Mars	22 21.1	10 13
Jupiter	303 32.7	15 27
Saturn	227 06.7	20 31

	G.M.T.	SUN G.H.A.	SUN Dec.	MOON G.H.A.	v	MOON Dec.	d	H.P.
	d h	° ′	° ′	° ′	′	° ′	′	′
	26 00	178 32.2	N 2 04.4	110 13.0	12.3	N18 29.3	1.6	54.2
	01	193 32.4	05.4	124 44.3	12.3	18 30.9	1.5	54.2
	02	208 32.6	06.4	139 15.6	12.3	18 32.4	1.5	54.2
	03	223 32.8	· · 07.4	153 46.9	12.2	18 33.9	1.4	54.2
	04	238 32.9	08.4	168 18.1	12.2	18 35.3	1.2	54.3
	05	253 33.1	09.3	182 49.3	12.2	18 36.5	1.2	54.3
	06	268 33.3	N 2 10.3	197 20.5	12.2	N18 37.7	1.2	54.3
	07	283 33.5	11.3	211 51.7	12.2	18 38.9	1.0	54.3
S	08	298 33.7	12.3	226 22.9	12.2	18 39.9	0.9	54.3
A	09	313 33.9	· · 13.3	240 54.1	12.2	18 40.8	0.9	54.3
T	10	328 34.1	14.2	255 25.3	12.1	18 41.7	0.8	54.3
U	11	343 34.3	15.2	269 56.4	12.1	18 42.5	0.6	54.3
R	12	358 34.5	N 2 16.2	284 27.5	12.1	N18 43.1	0.6	54.3
D	13	13 34.7	17.2	298 58.6	12.1	18 43.7	0.6	54.3
A	14	28 34.8	18.2	313 29.7	12.1	18 44.3	0.4	54.4
Y	15	43 35.0	· · 19.1	328 00.8	12.1	18 44.7	0.3	54.4
	16	58 35.2	20.1	342 31.9	12.0	18 45.0	0.3	54.4
	17	73 35.4	21.1	357 02.9	12.1	18 45.3	0.1	54.4
	18	88 35.6	N 2 22.1	11 34.0	12.0	N18 45.4	0.1	54.4
	19	103 35.8	23.1	26 05.0	12.0	18 45.5	0.0	54.4
	20	118 36.0	24.0	40 36.0	12.0	18 45.5	0.1	54.4
	21	133 36.2	· · 25.0	55 07.0	12.0	18 45.4	0.2	54.4
	22	148 36.4	26.0	69 38.0	11.9	18 45.2	0.3	54.5
	23	163 36.5	27.0	84 08.9	12.0	18 44.9	0.4	54.5
	27 00	178 36.7	N 2 28.0	98 39.9	11.9	N18 44.5	0.4	54.5
	01	193 36.9	28.9	113 10.8	12.0	18 44.1	0.5	54.5
	02	208 37.1	29.9	127 41.8	11.9	18 43.6	0.7	54.5
	03	223 37.3	· · 30.9	142 12.7	11.9	18 42.9	0.7	54.5
	04	238 37.5	31.9	156 43.6	11.9	18 42.2	0.8	54.5
	05	253 37.7	32.9	171 14.5	11.9	18 41.4	0.9	54.6
	06	268 37.9	N 2 33.8	185 45.4	11.8	N18 40.5	1.0	54.6
	07	283 38.1	34.8	200 16.2	11.9	18 39.5	1.1	54.6
	08	298 38.3	35.8	214 47.1	11.8	18 38.4	1.1	54.6
S	09	313 38.4	· · 36.8	229 17.9	11.9	18 37.3	1.3	54.6
U	10	328 38.6	37.8	243 48.8	11.8	18 36.0	1.3	54.6
N	11	343 38.8	38.7	258 19.6	11.8	18 34.7	1.4	54.7
D	12	358 39.0	N 2 39.7	272 50.4	11.8	N18 33.3	1.5	54.7
A	13	13 39.2	40.7	287 21.2	11.8	18 31.8	1.7	54.7
Y	14	28 39.4	41.7	301 52.0	11.8	18 30.1	1.6	54.7
	15	43 39.6	· · 42.6	316 22.8	11.7	18 28.5	1.8	54.7
	16	58 39.8	43.6	330 53.5	11.8	18 26.7	1.9	54.7
	17	73 40.0	44.6	345 24.3	11.7	18 24.8	2.0	54.8
	18	88 40.2	N 2 45.6	359 55.0	11.8	N18 22.8	2.0	54.8
	19	103 40.3	46.6	14 25.8	11.7	18 20.8	2.2	54.8
	20	118 40.5	47.5	28 56.5	11.7	18 18.6	2.2	54.8
	21	133 40.7	· · 48.5	43 27.2	11.7	18 16.4	2.3	54.8
	22	148 40.9	49.5	57 57.9	11.7	18 14.1	2.4	54.9
	23	163 41.1	50.5	72 28.6	11.7	18 11.7	2.5	54.9
	28 00	178 41.3	N 2 51.4	86 59.3	11.7	N18 09.2	2.6	54.9
	01	193 41.5	52.4	101 30.0	11.7	18 06.6	2.7	54.9
	02	208 41.7	53.4	116 00.7	11.6	18 03.9	2.7	54.9
	03	223 41.9	· · 54.4	130 31.3	11.7	18 01.2	2.9	55.0
	04	238 42.0	55.3	145 02.0	11.6	17 58.3	2.9	55.0
	05	253 42.2	56.3	159 32.6	11.7	17 55.4	3.0	55.0
	06	268 42.4	N 2 57.3	174 03.3	11.6	N17 52.4	3.2	55.0
	07	283 42.6	58.3	188 33.9	11.6	17 49.2	3.2	55.1
	08	298 42.8	2 59.3	203 04.5	11.6	17 46.0	3.3	55.1
M	09	313 43.0	3 00.2	217 35.1	11.6	17 42.7	3.3	55.1
O	10	328 43.2	01.2	232 05.7	11.6	17 39.4	3.5	55.1
N	11	343 43.4	02.2	246 36.3	11.6	17 35.9	3.6	55.2
D	12	358 43.6	N 3 03.2	261 06.9	11.6	N17 32.3	3.6	55.2
A	13	13 43.8	04.1	275 37.5	11.5	17 28.7	3.8	55.2
Y	14	28 43.9	05.1	290 08.0	11.6	17 24.9	3.8	55.2
	15	43 44.1	· · 06.1	304 38.6	11.6	17 21.1	3.9	55.3
	16	58 44.3	07.1	319 09.2	11.5	17 17.2	4.0	55.3
	17	73 44.5	08.0	333 39.7	11.5	17 13.2	4.1	55.3
	18	88 44.7	N 3 09.0	348 10.2	11.6	N17 09.1	4.2	55.3
	19	103 44.9	10.0	2 40.8	11.5	17 04.9	4.2	55.4
	20	118 45.1	11.0	17 11.3	11.5	17 00.7	4.4	55.4
	21	133 45.3	· · 11.9	31 41.8	11.5	16 56.3	4.4	55.4
	22	148 45.5	12.9	46 12.3	11.5	16 51.9	4.5	55.4
	23	163 45.7	13.9	60 42.8	11.5	16 47.4	4.6	55.5
		S.D. 16.1	d 1.0	S.D. 14.8		14.9		15.0

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 26	Moonrise 27	Moonrise 28	Moonrise 29
°	h m	h m	h m	h m	h m	h m	h m
N 72	02 30	04 12	05 23	▭	▭	07 08	09 14
N 70	02 58	04 24	05 27	06 23	07 10	08 25	09 55
68	03 19	04 34	05 31	07 08	07 56	09 03	10 23
66	03 35	04 42	05 34	07 38	08 26	09 29	10 44
64	03 48	04 48	05 37	08 00	08 49	09 49	11 01
62	03 58	04 54	05 39	08 18	09 07	10 06	11 14
60	04 07	04 59	05 41	08 33	09 22	10 20	11 26
N 58	04 15	05 03	05 43	08 46	09 34	10 31	11 36
56	04 22	05 07	05 44	08 57	09 45	10 42	11 45
54	04 27	05 10	05 46	09 06	09 55	10 50	11 52
52	04 32	05 13	05 47	09 15	10 04	10 58	11 59
50	04 37	05 16	05 48	09 23	10 11	11 06	12 06
45	04 46	05 21	05 51	09 39	10 28	11 21	12 19
N 40	04 54	05 25	05 53	09 53	10 41	11 34	12 30
35	04 59	05 29	05 54	10 04	10 53	11 44	12 39
30	05 04	05 32	05 56	10 14	11 02	11 54	12 48
20	05 10	05 36	05 58	10 31	11 20	12 10	13 02
N 10	05 15	05 39	06 00	10 47	11 35	12 24	13 14
0	05 17	05 41	06 02	11 01	11 49	12 37	13 26
S 10	05 19	05 43	06 04	11 15	12 03	12 50	13 38
20	05 18	05 44	06 06	11 30	12 18	13 04	13 50
30	05 16	05 44	06 08	11 47	12 35	13 21	14 04
35	05 14	05 43	06 09	11 57	12 45	13 30	14 12
40	05 11	05 43	06 10	12 09	12 56	13 41	14 22
45	05 08	05 42	06 11	12 23	13 10	13 53	14 33
S 50	05 03	05 40	06 13	12 39	13 26	14 08	14 46
52	05 00	05 40	06 13	12 47	13 34	14 15	14 52
54	04 57	05 39	06 14	12 56	13 43	14 23	14 59
56	04 54	05 38	06 15	13 06	13 52	14 32	15 06
58	04 50	05 37	06 16	13 17	14 03	14 42	15 14
S 60	04 46	05 35	06 17	13 30	14 16	14 53	15 24

Lat.	Sunset	Twilight Civil	Twilight Naut.	Moonset 26	Moonset 27	Moonset 28	Moonset 29
°	h m	h m	h m	h m	h m	h m	h m
N 72	18 51	20 02	21 48	▭	▭	05 47	05 22
N 70	18 46	19 50	21 17	03 12	04 04	04 30	04 41
68	18 42	19 40	20 56	02 27	03 18	03 51	04 12
66	18 39	19 31	20 39	01 57	02 47	03 25	03 51
64	18 36	19 24	20 26	01 35	02 25	03 04	03 34
62	18 33	19 19	20 15	01 17	02 07	02 47	03 19
60	18 31	19 14	20 06	01 02	01 52	02 33	03 07
N 58	18 29	19 09	19 58	00 49	01 39	02 21	02 57
56	18 28	19 05	19 51	00 39	01 28	02 11	02 48
54	18 26	19 02	19 45	00 29	01 18	02 02	02 40
52	18 25	18 59	19 40	00 21	01 10	01 54	02 33
50	18 24	18 56	19 35	00 13	01 02	01 46	02 26
45	18 21	18 51	19 26	24 46	00 46	01 31	02 12
N 40	18 19	18 46	19 18	24 32	00 32	01 18	02 00
35	18 17	18 43	19 12	24 20	00 20	01 07	01 50
30	18 16	18 40	19 08	24 10	00 10	00 57	01 42
20	18 13	18 35	19 01	23 53	24 40	00 40	01 26
N 10	18 11	18 32	18 56	23 38	24 26	00 26	01 13
0	18 09	18 29	18 53	23 24	24 12	00 12	01 01
S 10	18 07	18 28	18 52	23 10	23 58	24 48	00 48
20	18 05	18 27	18 52	22 54	23 44	24 35	00 35
30	18 03	18 27	18 54	22 37	23 27	24 19	00 19
35	18 02	18 27	18 56	22 27	23 17	24 10	00 10
40	18 00	18 27	18 59	22 15	23 06	24 00	00 00
45	17 59	18 28	19 02	22 02	22 52	23 48	24 48
S 50	17 57	18 29	19 07	21 45	22 36	23 33	24 36
52	17 57	18 30	19 09	21 37	22 29	23 27	24 30
54	17 56	18 31	19 12	21 28	22 20	23 19	24 24
56	17 55	18 32	19 15	21 18	22 11	23 10	24 16
58	17 54	18 33	19 19	21 07	22 00	23 01	24 09
S 60	17 53	18 34	19 23	20 54	21 47	22 50	23 59

Day	SUN Eqn. of Time 00ʰ	SUN Eqn. of Time 12ʰ	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
	m s	m s	h m	h m	h m	d	
26	05 52	05 43	12 06	17 12	04 48	07	
27	05 33	05 24	12 05	18 00	05 36	08	◐
28	05 15	05 06	12 05	18 49	06 25	09	

1977 MARCH 29, 30, 31 (TUES., WED., THURS.)

G.M.T.		ARIES	VENUS −3.5		MARS +1.4		JUPITER −1.7		SATURN +0.3	
		G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
d	h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
29	00	186 17.0	169 48.3	N15 42.3	207 09.5	S10 04.3	129 26.7	N19 18.2	53 26.8	N18 40.0
	01	201 19.4	184 52.0	41.8	222 10.1	03.5	144 28.7	18.3	68 29.3	40.0
	02	216 21.9	199 55.6	41.3	237 10.8	02.8	159 30.7	18.4	83 31.8	40.0
	03	231 24.4	214 59.3	·· 40.8	252 11.4	·· 02.1	174 32.7	·· 18.5	98 34.3	·· 40.1
	04	246 26.8	230 02.9	40.4	267 12.0	01.4	189 34.6	18.6	113 36.9	40.1
	05	261 29.3	245 06.6	39.9	282 12.6	10 00.7	204 36.6	18.7	128 39.4	40.1
	06	276 31.8	260 10.3	N15 39.4	297 13.3	S 9 59.9	219 38.6	N19 18.8	143 41.9	N18 40.1
	07	291 34.2	275 13.9	38.9	312 13.9	59.2	234 40.6	19.0	158 44.4	40.1
T	08	306 36.7	290 17.6	38.4	327 14.5	58.5	249 42.6	19.1	173 47.0	40.1
U	09	321 39.2	305 21.3	·· 37.9	342 15.1	·· 57.8	264 44.5	·· 19.2	188 49.5	·· 40.1
E	10	336 41.6	320 24.9	37.4	357 15.8	57.1	279 46.5	19.3	203 52.0	40.2
S	11	351 44.1	335 28.6	36.9	12 16.4	56.3	294 48.5	19.4	218 54.5	40.2
D	12	6 46.6	350 32.3	N15 36.3	27 17.0	S 9 55.6	309 50.5	N19 19.5	233 57.0	N18 40.2
A	13	21 49.0	5 36.0	35.8	42 17.6	54.9	324 52.4	19.6	248 59.6	40.2
Y	14	36 51.5	20 39.6	35.3	57 18.3	54.2	339 54.4	19.7	264 02.1	40.2
	15	51 53.9	35 43.3	·· 34.8	72 18.9	·· 53.5	354 56.4	·· 19.8	279 04.6	·· 40.2
	16	66 56.4	50 47.0	34.3	87 19.5	52.7	9 58.4	19.9	294 07.1	40.3
	17	81 58.9	65 50.7	33.8	102 20.1	52.0	25 00.4	20.0	309 09.7	40.3
	18	97 01.3	80 54.4	N15 33.2	117 20.8	S 9 51.3	40 02.3	N19 20.2	324 12.2	N18 40.3
	19	112 03.8	95 58.1	32.7	132 21.4	50.6	55 04.3	20.3	339 14.7	40.3
	20	127 06.3	111 01.8	32.2	147 22.0	49.8	70 06.3	20.4	354 17.2	40.3
	21	142 08.7	126 05.5	·· 31.6	162 22.6	·· 49.1	85 08.3	·· 20.5	9 19.7	·· 40.3
	22	157 11.2	141 09.2	31.1	177 23.3	48.4	100 10.2	20.6	24 22.3	40.3
	23	172 13.7	156 12.9	30.6	192 23.9	47.7	115 12.2	20.7	39 24.8	40.4
30	00	187 16.1	171 16.6	N15 30.0	207 24.5	S 9 47.0	130 14.2	N19 20.8	54 27.3	N18 40.4
	01	202 18.6	186 20.3	29.5	222 25.1	46.2	145 16.2	20.9	69 29.8	40.4
	02	217 21.0	201 24.0	28.9	237 25.8	45.5	160 18.2	21.0	84 32.3	40.4
	03	232 23.5	216 27.7	·· 28.4	252 26.4	·· 44.8	175 20.1	·· 21.1	99 34.9	·· 40.4
	04	247 26.0	231 31.4	27.8	267 27.0	44.1	190 22.1	21.2	114 37.4	40.4
	05	262 28.4	246 35.1	27.3	282 27.7	43.3	205 24.1	21.4	129 39.9	40.5
	06	277 30.9	261 38.8	N15 26.7	297 28.3	S 9 42.6	220 26.1	N19 21.5	144 42.4	N18 40.5
W	07	292 33.4	276 42.5	26.2	312 28.9	41.9	235 28.0	21.6	159 44.9	40.5
E	08	307 35.8	291 46.3	25.6	327 29.5	41.2	250 30.0	21.7	174 47.5	40.5
D	09	322 38.3	306 50.0	·· 25.0	342 30.2	·· 40.4	265 32.0	·· 21.8	189 50.0	·· 40.5
N	10	337 40.8	321 53.7	24.5	357 30.8	39.7	280 34.0	21.9	204 52.5	40.5
E	11	352 43.2	336 57.4	23.9	12 31.4	39.0	295 35.9	22.0	219 55.0	40.5
S	12	7 45.7	352 01.2	N15 23.3	27 32.0	S 9 38.3	310 37.9	N19 22.1	234 57.5	N18 40.6
D	13	22 48.2	7 04.9	22.8	42 32.7	37.5	325 39.9	22.2	250 00.0	40.6
A	14	37 50.6	22 08.6	22.2	57 33.3	36.8	340 41.9	22.3	265 02.6	40.6
Y	15	52 53.1	37 12.3	·· 21.6	72 33.9	·· 36.1	355 43.8	·· 22.5	280 05.1	·· 40.6
	16	67 55.5	52 16.1	21.0	87 34.6	35.4	10 45.8	22.6	295 07.6	40.6
	17	82 58.0	67 19.8	20.5	102 35.2	34.6	25 47.8	22.7	310 10.1	40.6
	18	98 00.5	82 23.5	N15 19.9	117 35.8	S 9 33.9	40 49.8	N19 22.8	325 12.6	N18 40.6
	19	113 02.9	97 27.3	19.3	132 36.5	33.2	55 51.7	22.9	340 15.1	40.6
	20	128 05.4	112 31.0	18.7	147 37.1	32.5	70 53.7	23.0	355 17.7	40.7
	21	143 07.9	127 34.8	·· 18.1	162 37.7	·· 31.7	85 55.7	·· 23.1	10 20.2	·· 40.7
	22	158 10.3	142 38.5	17.5	177 38.3	31.0	100 57.7	23.2	25 22.7	40.7
	23	173 12.8	157 42.3	16.9	192 39.0	30.3	115 59.6	23.3	40 25.2	40.7
31	00	188 15.3	172 46.0	N15 16.3	207 39.6	S 9 29.6	131 01.6	N19 23.4	55 27.7	N18 40.7
	01	203 17.7	187 49.8	15.7	222 40.2	28.8	146 03.6	23.5	70 30.2	40.7
	02	218 20.2	202 53.5	15.1	237 40.9	28.1	161 05.5	23.7	85 32.8	40.7
	03	233 22.7	217 57.3	·· 14.5	252 41.5	·· 27.4	176 07.5	·· 23.8	100 35.3	·· 40.8
	04	248 25.1	233 01.0	13.9	267 42.1	26.7	191 09.5	23.9	115 37.8	40.8
	05	263 27.6	248 04.8	13.3	282 42.8	25.9	206 11.5	24.0	130 40.3	40.8
	06	278 30.0	263 08.5	N15 12.7	297 43.4	S 9 25.2	221 13.4	N19 24.1	145 42.8	N18 40.8
	07	293 32.5	278 12.3	12.0	312 44.0	24.5	236 15.4	24.2	160 45.3	40.8
T	08	308 35.0	293 16.0	11.4	327 44.6	23.7	251 17.4	24.3	175 47.8	40.8
H	09	323 37.4	308 19.8	·· 10.8	342 45.3	·· 23.0	266 19.3	·· 24.4	190 50.4	·· 40.8
U	10	338 39.9	323 23.6	10.2	357 45.9	22.3	281 21.3	24.5	205 52.9	40.9
R	11	353 42.4	338 27.3	09.5	12 46.5	21.6	296 23.3	24.6	220 55.4	40.9
S	12	8 44.8	353 31.1	N15 08.9	27 47.2	S 9 20.8	311 25.3	N19 24.8	235 57.9	N18 40.9
D	13	23 47.3	8 34.9	08.3	42 47.8	20.1	326 27.2	24.9	251 00.4	40.9
A	14	38 49.8	23 38.6	07.7	57 48.4	19.4	341 29.2	25.0	266 02.9	40.9
Y	15	53 52.2	38 42.4	·· 07.0	72 49.1	·· 18.7	356 31.2	·· 25.1	281 05.4	·· 40.9
	16	68 54.7	53 46.2	06.4	87 49.7	17.9	11 33.1	25.2	296 08.0	40.9
	17	83 57.1	68 50.0	05.7	102 50.3	17.2	26 35.1	25.3	311 10.5	40.9
	18	98 59.6	83 53.7	N15 05.1	117 51.0	S 9 16.5	41 37.1	N19 25.4	326 13.0	N18 41.0
	19	114 02.1	98 57.5	04.5	132 51.6	15.7	56 39.0	25.5	341 15.5	41.0
	20	129 04.5	114 01.3	03.8	147 52.2	15.0	71 41.0	25.6	356 18.0	41.0
	21	144 07.0	129 05.1	·· 03.2	162 52.9	·· 14.3	86 43.0	·· 25.7	11 20.5	·· 41.0
	22	159 09.5	144 08.9	02.5	177 53.5	13.5	101 45.0	25.8	26 23.0	41.0
	23	174 11.9	159 12.6	01.8	192 54.1	12.8	116 46.9	26.0	41 25.5	41.0
Mer. Pass.		h m 11 29.0	v 3.7	d 0.6	v 0.6	d 0.7	v 2.0	d 0.1	v 2.5	d 0.0

STARS

Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 39.4	S40 24.0
Achernar	335 47.6	S57 21.3
Acrux	173 39.1	S62 58.5
Adhara	255 33.9	S28 56.8
Aldebaran	291 20.8	N16 27.7
Alioth	166 44.1	N56 04.9
Alkaid	153 19.9	N49 25.4
Al Na'ir	28 18.3	S47 04.2
Alnilam	276 14.1	S 1 13.2
Alphard	218 22.6	S 8 33.8
Alphecca	126 33.8	N26 47.3
Alpheratz	358 12.1	N28 57.8
Altair	62 34.9	N 8 48.4
Ankaa	353 43.0	S42 25.8
Antares	112 59.5	S26 22.9
Arcturus	146 20.3	N19 17.9
Atria	108 25.6	S68 59.0
Avior	234 28.8	S59 26.6
Bellatrix	279 01.4	N 6 19.6
Betelgeuse	271 30.9	N 7 24.0
Canopus	264 08.3	S52 41.4
Capella	281 14.9	N45 58.6
Deneb	49 50.2	N45 11.8
Denebola	183 01.1	N14 41.8
Diphda	349 23.6	S18 06.8
Dubhe	194 24.5	N61 52.4
Elnath	278 47.2	N28 35.3
Eltanin	90 58.7	N51 29.3
Enif	34 14.1	N 9 46.1
Fomalhaut	15 54.3	S29 44.6
Gacrux	172 30.7	S56 59.3
Gienah	176 20.0	S17 25.1
Hadar	149 26.0	S60 15.8
Hamal	328 31.9	N23 21.2
Kaus Aust.	84 19.9	S34 23.6
Kochab	137 18.0	N74 14.8
Markab	14 05.8	N15 04.9
Menkar	314 43.8	N 3 59.9
Menkent	148 39.4	S36 15.5
Miaplacidus	221 44.8	S69 37.8
Mirfak	309 19.8	N49 46.9
Nunki	76 32.1	S26 19.4
Peacock	54 02.4	S56 48.3
Pollux	244 00.9	N28 04.8
Procyon	245 28.2	N 5 16.8
Rasalhague	96 31.7	N12 34.5
Regulus	208 12.2	N12 04.5
Rigel	281 38.4	S 8 13.9
Rigil Kent.	140 28.4	S60 44.4
Sabik	102 43.7	S15 41.8
Schedar	350 12.2	N56 24.7
Shaula	96 58.8	S37 05.1
Sirius	258 57.8	S16 41.4
Spica	158 59.7	S11 02.7
Suhail	223 12.2	S43 20.8
Vega	80 57.4	N38 45.5
Zuben'ubi	137 35.3	S15 56.9

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	344 00.5	12 32
Mars	20 08.4	10 10
Jupiter	302 58.1	15 17
Saturn	227 11.2	20 19

	G.M.T.	SUN G.H.A.	SUN Dec.	MOON G.H.A.	v	MOON Dec.	d	H.P.
	d h	° ′	° ′	° ′	′	° ′	′	′
	29 00	178 45.8	N 3 14.9	75 13.3	11.5	N16 42.8	4.7	55.5
	01	193 46.0	15.8	89 43.8	11.5	16 38.1	4.8	55.5
	02	208 46.2	16.8	104 14.3	11.5	16 33.3	4.9	55.6
	03	223 46.4	·· 17.8	118 44.8	11.4	16 28.4	5.0	55.6
	04	238 46.6	18.8	133 15.2	11.5	16 23.4	5.0	55.6
	05	253 46.8	19.7	147 45.7	11.5	16 18.4	5.1	55.6
	06	268 47.0	N 3 20.7	162 16.2	11.4	N16 13.3	5.2	55.7
	07	283 47.2	21.7	176 46.6	11.4	16 08.1	5.3	55.7
	08	298 47.4	22.6	191 17.0	11.5	16 02.8	5.4	55.7
T	09	313 47.5	·· 23.6	205 47.5	11.4	15 57.4	5.5	55.8
U	10	328 47.7	24.6	220 17.9	11.4	15 51.9	5.5	55.8
E	11	343 47.9	25.6	234 48.3	11.4	15 46.4	5.7	55.8
S	12	358 48.1	N 3 26.5	249 18.7	11.4	N15 40.7	5.7	55.8
D	13	13 48.3	27.5	263 49.1	11.4	15 35.0	5.8	55.9
A	14	28 48.5	28.5	278 19.5	11.4	15 29.2	5.9	55.9
Y	15	43 48.7	·· 29.5	292 49.9	11.4	15 23.3	6.0	55.9
	16	58 48.9	30.4	307 20.3	11.4	15 17.3	6.0	56.0
	17	73 49.1	31.4	321 50.7	11.4	15 11.3	6.2	56.0
	18	88 49.3	N 3 32.4	336 21.1	11.3	N15 05.1	6.2	56.0
	19	103 49.4	33.4	350 51.4	11.4	14 58.9	6.3	56.1
	20	118 49.6	34.3	5 21.8	11.3	14 52.6	6.4	56.1
	21	133 49.8	·· 35.3	19 52.1	11.4	14 46.2	6.5	56.1
	22	148 50.0	36.3	34 22.5	11.3	14 39.7	6.5	56.2
	23	163 50.2	37.2	48 52.8	11.3	14 33.2	6.6	56.2
	30 00	178 50.4	N 3 38.2	63 23.1	11.3	N14 26.6	6.8	56.2
	01	193 50.6	39.2	77 53.4	11.3	14 19.8	6.7	56.3
	02	208 50.8	40.2	92 23.7	11.3	14 13.1	6.9	56.3
	03	223 51.0	·· 41.1	106 54.0	11.3	14 06.2	7.0	56.3
	04	238 51.1	42.1	121 24.3	11.3	13 59.2	7.0	56.4
	05	253 51.3	43.1	135 54.6	11.3	13 52.2	7.1	56.4
	06	268 51.5	N 3 44.0	150 24.9	11.3	N13 45.1	7.2	56.4
W	07	283 51.7	45.0	164 55.2	11.2	13 37.9	7.3	56.5
E	08	298 51.9	46.0	179 25.4	11.3	13 30.6	7.3	56.5
D	09	313 52.1	·· 47.0	193 55.7	11.2	13 23.3	7.4	56.5
N	10	328 52.3	47.9	208 25.9	11.3	13 15.9	7.5	56.6
E	11	343 52.5	48.9	222 56.2	11.2	13 08.4	7.6	56.6
S	12	358 52.7	N 3 49.9	237 26.4	11.2	N13 00.8	7.7	56.6
D	13	13 52.8	50.8	251 56.6	11.2	12 53.1	7.7	56.7
A	14	28 53.0	51.8	266 26.8	11.2	12 45.4	7.8	56.7
Y	15	43 53.2	·· 52.8	280 57.0	11.2	12 37.6	7.9	56.7
	16	58 53.4	53.7	295 27.2	11.2	12 29.7	7.9	56.8
	17	73 53.6	54.7	309 57.4	11.1	12 21.8	8.1	56.8
	18	88 53.8	N 3 55.7	324 27.5	11.2	N12 13.7	8.1	56.9
	19	103 54.0	56.6	338 57.7	11.1	12 05.6	8.1	56.9
	20	118 54.2	57.6	353 27.8	11.2	11 57.5	8.3	56.9
	21	133 54.4	·· 58.6	7 58.0	11.1	11 49.2	8.3	57.0
	22	148 54.5	3 59.6	22 28.1	11.1	11 40.9	8.4	57.0
	23	163 54.7	4 00.5	36 58.2	11.1	11 32.5	8.5	57.0
	31 00	178 54.9	N 4 01.5	51 28.3	11.1	N11 24.0	8.5	57.1
	01	193 55.1	02.5	65 58.4	11.1	11 15.5	8.6	57.1
	02	208 55.3	03.4	80 28.5	11.0	11 06.9	8.7	57.1
	03	223 55.5	·· 04.4	94 58.5	11.1	10 58.2	8.7	57.2
	04	238 55.7	05.4	109 28.6	11.0	10 49.5	8.8	57.2
	05	253 55.9	06.3	123 58.6	11.0	10 40.7	8.9	57.3
	06	268 56.1	N 4 07.3	138 28.6	11.1	N10 31.8	9.0	57.3
	07	283 56.2	08.3	152 58.7	11.0	10 22.8	9.0	57.3
T	08	298 56.4	09.2	167 28.7	10.9	10 13.8	9.0	57.4
H	09	313 56.6	·· 10.2	181 58.6	11.0	10 04.8	9.2	57.4
U	10	328 56.8	11.2	196 28.6	11.0	9 55.6	9.2	57.4
R	11	343 57.0	12.1	210 58.6	10.9	9 46.4	9.3	57.5
S	12	358 57.2	N 4 13.1	225 28.5	10.9	N 9 37.1	9.3	57.5
D	13	13 57.4	14.1	239 58.4	11.0	9 27.8	9.4	57.6
A	14	28 57.6	15.0	254 28.4	10.8	9 18.4	9.5	57.6
Y	15	43 57.8	·· 16.0	268 58.2	10.9	9 08.9	9.5	57.6
	16	58 57.9	17.0	283 28.1	10.9	8 59.4	9.6	57.7
	17	73 58.1	17.9	297 58.0	10.8	8 49.8	9.6	57.7
	18	88 58.3	N 4 18.9	312 27.8	10.9	N 8 40.2	9.7	57.7
	19	103 58.5	19.9	326 57.7	10.8	8 30.5	9.8	57.8
	20	118 58.7	20.8	341 27.5	10.8	8 20.7	9.8	57.8
	21	133 58.9	·· 21.8	355 57.3	10.7	8 10.9	9.9	57.9
	22	148 59.1	22.8	10 27.0	10.8	8 01.0	9.9	57.9
	23	163 59.3	23.7	24 56.8	10.7	7 51.1	10.0	57.9
		S.D. 16.0	d 1.0	S.D. 15.2		15.4		15.7

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 29	Moonrise 30	Moonrise 31	Moonrise 1
°	h m	h m	h m	h m	h m	h m	h m
N 72	02 02	03 54	05 07	09 14	11 07	12 59	14 50
N 70	02 37	04 09	05 13	09 55	11 33	13 14	14 58
68	03 02	04 20	05 18	10 23	11 52	13 26	15 04
66	03 20	04 29	05 23	10 44	12 07	13 36	15 09
64	03 35	04 37	05 26	11 01	12 19	13 44	15 13
62	03 47	04 44	05 29	11 14	12 30	13 51	15 16
60	03 57	04 49	05 32	11 26	12 39	13 57	15 19
N 58	04 05	04 54	05 34	11 36	12 47	14 02	15 22
56	04 13	04 59	05 36	11 45	12 54	14 07	15 25
54	04 19	05 02	05 38	11 52	13 00	14 11	15 27
52	04 25	05 06	05 40	11 59	13 05	14 15	15 29
50	04 30	05 09	05 42	12 06	13 10	14 19	15 31
45	04 40	05 15	05 45	12 19	13 21	14 26	15 35
N 40	04 48	05 20	05 48	12 30	13 30	14 33	15 38
35	04 55	05 25	05 50	12 39	13 37	14 38	15 41
30	05 00	05 28	05 52	12 48	13 44	14 43	15 43
20	05 08	05 34	05 56	13 02	13 56	14 51	15 48
N 10	05 13	05 38	05 59	13 14	14 06	14 58	15 52
0	05 16	05 41	06 01	13 26	14 15	15 05	15 55
S 10	05 18	05 43	06 04	13 38	14 25	15 12	15 59
20	05 19	05 44	06 06	13 50	14 35	15 19	16 03
30	05 18	05 45	06 09	14 04	14 46	15 27	16 07
35	05 16	05 46	06 11	14 12	14 53	15 31	16 09
40	05 14	05 46	06 13	14 22	15 00	15 37	16 12
45	05 11	05 46	06 15	14 33	15 09	15 43	16 16
S 50	05 07	05 45	06 17	14 46	15 19	15 50	16 19
52	05 05	05 45	06 18	14 52	15 24	15 54	16 21
54	05 03	05 44	06 20	14 59	15 30	15 57	16 23
56	05 00	05 44	06 21	15 06	15 35	16 01	16 25
58	04 57	05 43	06 22	15 14	15 42	16 06	16 28
S 60	04 54	05 42	06 24	15 24	15 49	16 11	16 30

Lat.	Sunset	Twilight Civil	Twilight Naut.	Moonset 29	Moonset 30	Moonset 31	Moonset 1
°	h m	h m	h m	h m	h m	h m	h m
N 72	19 05	20 19	22 16	05 22	05 12	05 04	04 57
N 70	18 58	20 03	21 37	04 41	04 45	04 47	04 48
68	18 53	19 52	21 11	04 12	04 25	04 34	04 40
66	18 48	19 42	20 52	03 51	04 09	04 23	04 33
64	18 45	19 34	20 37	03 34	03 56	04 13	04 28
62	18 41	19 27	20 25	03 19	03 45	04 05	04 23
60	18 39	19 21	20 14	03 07	03 35	03 58	04 19
N 58	18 36	19 16	20 05	02 57	03 27	03 52	04 15
56	18 34	19 12	19 58	02 48	03 19	03 47	04 12
54	18 32	19 08	19 51	02 40	03 13	03 42	04 08
52	18 30	19 04	19 46	02 33	03 07	03 37	04 06
50	18 28	19 01	19 40	02 26	03 01	03 33	04 03
45	18 25	18 55	19 30	02 12	02 50	03 25	03 58
N 40	18 22	18 49	19 21	02 00	02 40	03 17	03 53
35	18 20	18 45	19 15	01 50	02 32	03 11	03 49
30	18 17	18 41	19 10	01 42	02 24	03 05	03 46
20	18 14	18 36	19 02	01 26	02 11	02 56	03 39
N 10	18 11	18 32	18 56	01 13	02 00	02 47	03 34
0	18 08	18 28	18 53	01 01	01 50	02 39	03 29
S 10	18 05	18 26	18 50	00 48	01 39	02 31	03 23
20	18 02	18 24	18 50	00 35	01 28	02 22	03 18
30	17 59	18 23	18 51	00 19	01 14	02 12	03 11
35	17 57	18 23	18 52	00 10	01 07	02 06	03 08
40	17 56	18 23	18 54	00 00	00 58	01 59	03 03
45	17 53	18 23	18 57	24 48	00 48	01 52	02 58
S 50	17 51	18 23	19 00	24 36	00 36	01 42	02 53
52	17 50	18 23	19 02	24 30	00 30	01 38	02 50
54	17 48	18 24	19 05	24 24	00 24	01 33	02 47
56	17 47	18 24	19 07	24 16	00 16	01 28	02 43
58	17 46	18 25	19 10	24 09	00 09	01 22	02 40
S 60	17 44	18 25	19 14	23 59	25 15	01 15	02 35

Day	SUN Eqn. of Time 00ʰ	SUN Eqn. of Time 12ʰ	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
	m s	m s	h m	h m	h m	d	
29	04 57	04 48	12 05	19 38	07 13	10	
30	04 39	04 30	12 04	20 27	08 02	11	◐
31	04 21	04 12	12 04	21 17	08 52	12	

1977 APRIL 1, 2, 3 (FRI., SAT., SUN.)

G.M.T.	ARIES	VENUS −3.4		MARS +1.4		JUPITER −1.7		SATURN +0.3	
	G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
d h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
1 00	189 14.4	174 16.4	N15 01.2	207 54.8	S 9 12.1	131 48.9	N19 26.1	56 28.0	N18 41.0
01	204 16.9	189 20.2	15 00.5	222 55.4	11.4	146 50.9	26.2	71 30.6	41.0
02	219 19.3	204 24.0	14 59.9	237 56.0	10.6	161 52.8	26.3	86 33.1	41.1
03	234 21.8	219 27.8	·· 59.2	252 56.7	·· 09.9	176 54.8	·· 26.4	101 35.6	·· 41.1
04	249 24.3	234 31.6	58.5	267 57.3	09.2	191 56.8	26.5	116 38.1	41.1
05	264 26.7	249 35.4	57.9	282 57.9	08.4	206 58.7	26.6	131 40.6	41.1
06	279 29.2	264 39.2	N14 57.2	297 58.6	S 9 07.7	222 00.7	N19 26.7	146 43.1	N18 41.1
07	294 31.6	279 42.9	56.5	312 59.2	07.0	237 02.7	26.8	161 45.6	41.1
08	309 34.1	294 46.7	55.9	327 59.8	06.2	252 04.6	26.9	176 48.1	41.1
F 09	324 36.6	309 50.5	·· 55.2	343 00.5	·· 05.5	267 06.6	·· 27.1	191 50.6	·· 41.1
R 10	339 39.0	324 54.3	54.5	358 01.1	04.8	282 08.6	27.2	206 53.1	41.1
I 11	354 41.5	339 58.1	53.8	13 01.7	04.1	297 10.5	27.3	221 55.7	41.2
D 12	9 44.0	355 01.9	N14 53.1	28 02.4	S 9 03.3	312 12.5	N19 27.4	236 58.2	N18 41.2
A 13	24 46.4	10 05.7	52.4	43 03.0	02.6	327 14.5	27.5	252 00.7	41.2
Y 14	39 48.9	25 09.5	51.8	58 03.6	01.9	342 16.4	27.6	267 03.2	41.2
15	54 51.4	40 13.3	·· 51.1	73 04.3	·· 01.1	357 18.4	·· 27.7	282 05.7	·· 41.2
16	69 53.8	55 17.1	50.4	88 04.9	9 00.4	12 20.4	27.8	297 08.2	41.2
17	84 56.3	70 20.9	49.7	103 05.5	8 59.7	27 22.3	27.9	312 10.7	41.2
18	99 58.8	85 24.7	N14 49.0	118 06.2	S 8 58.9	42 24.3	N19 28.0	327 13.2	N18 41.2
19	115 01.2	100 28.6	48.3	133 06.8	58.2	57 26.3	28.2	342 15.7	41.3
20	130 03.7	115 32.4	47.6	148 07.5	57.5	72 28.2	28.3	357 18.2	41.3
21	145 06.1	130 36.2	·· 46.9	163 08.1	·· 56.7	87 30.2	·· 28.4	12 20.7	·· 41.3
22	160 08.6	145 40.0	46.2	178 08.7	56.0	102 32.2	28.5	27 23.2	41.3
23	175 11.1	160 43.8	45.5	193 09.4	55.3	117 34.1	28.6	42 25.8	41.3
2 00	190 13.5	175 47.6	N14 44.7	208 10.0	S 8 54.5	132 36.1	N19 28.7	57 28.3	N18 41.3
01	205 16.0	190 51.4	44.0	223 10.6	53.8	147 38.1	28.8	72 30.8	41.3
02	220 18.5	205 55.2	43.3	238 11.3	53.1	162 40.0	28.9	87 33.3	41.3
03	235 20.9	220 59.0	·· 42.6	253 11.9	·· 52.3	177 42.0	·· 29.0	102 35.8	·· 41.3
04	250 23.4	236 02.9	41.9	268 12.5	51.6	192 44.0	29.1	117 38.3	41.3
05	265 25.9	251 06.7	41.2	283 13.2	50.9	207 45.9	29.2	132 40.8	41.4
06	280 28.3	266 10.5	N14 40.4	298 13.8	S 8 50.1	222 47.9	N19 29.4	147 43.3	N18 41.4
07	295 30.8	281 14.3	39.7	313 14.5	49.4	237 49.8	29.5	162 45.8	41.4
S 08	310 33.3	296 18.1	39.0	328 15.1	48.7	252 51.8	29.6	177 48.3	41.4
A 09	325 35.7	311 22.0	·· 38.3	343 15.7	·· 47.9	267 53.8	·· 29.7	192 50.8	·· 41.4
T 10	340 38.2	326 25.8	37.5	358 16.4	47.2	282 55.7	29.8	207 53.3	41.4
U 11	355 40.6	341 29.6	36.8	13 17.0	46.5	297 57.7	29.9	222 55.8	41.4
R 12	10 43.1	356 33.4	N14 36.1	28 17.6	S 8 45.7	312 59.7	N19 30.0	237 58.3	N18 41.4
D 13	25 45.6	11 37.2	35.3	43 18.3	45.0	328 01.6	30.1	253 00.8	41.4
A 14	40 48.0	26 41.1	34.6	58 18.9	44.3	343 03.6	30.2	268 03.3	41.5
Y 15	55 50.5	41 44.9	·· 33.8	73 19.6	·· 43.5	358 05.6	·· 30.3	283 05.8	·· 41.5
16	70 53.0	56 48.7	33.1	88 20.2	42.8	13 07.5	30.5	298 08.3	41.5
17	85 55.4	71 52.5	32.3	103 20.8	42.0	28 09.5	30.6	313 10.8	41.5
18	100 57.9	86 56.4	N14 31.6	118 21.5	S 8 41.3	43 11.4	N19 30.7	328 13.3	N18 41.5
19	116 00.4	102 00.2	30.8	133 22.1	40.6	58 13.4	30.8	343 15.8	41.5
20	131 02.8	117 04.0	30.1	148 22.8	39.8	73 15.4	30.9	358 18.3	41.5
21	146 05.3	132 07.9	·· 29.3	163 23.4	·· 39.1	88 17.3	·· 31.0	13 20.9	·· 41.5
22	161 07.7	147 11.7	28.6	178 24.0	38.4	103 19.3	31.1	28 23.4	41.5
23	176 10.2	162 15.5	27.8	193 24.7	37.6	118 21.2	31.2	43 25.9	41.5
3 00	191 12.7	177 19.3	N14 27.1	208 25.3	S 8 36.9	133 23.2	N19 31.3	58 28.4	N18 41.6
01	206 15.1	192 23.2	26.3	223 25.9	36.2	148 25.2	31.4	73 30.9	41.6
02	221 17.6	207 27.0	25.5	238 26.6	35.4	163 27.1	31.6	88 33.4	41.6
03	236 20.1	222 30.8	·· 24.8	253 27.2	·· 34.7	178 29.1	·· 31.7	103 35.9	·· 41.6
04	251 22.5	237 34.7	24.0	268 27.9	33.9	193 31.1	31.8	118 38.4	41.6
05	266 25.0	252 38.5	23.2	283 28.5	33.2	208 33.0	31.9	133 40.9	41.6
06	281 27.5	267 42.3	N14 22.4	298 29.1	S 8 32.5	223 35.0	N19 32.0	148 43.4	N18 41.6
07	296 29.9	282 46.2	21.7	313 29.8	31.7	238 36.9	32.1	163 45.9	41.6
08	311 32.4	297 50.0	20.9	328 30.4	31.0	253 38.9	32.2	178 48.4	41.6
S 09	326 34.9	312 53.8	·· 20.1	343 31.1	·· 30.3	268 40.9	·· 32.3	193 50.9	·· 41.6
U 10	341 37.3	327 57.7	19.3	358 31.7	29.5	283 42.8	32.4	208 53.4	41.6
N 11	356 39.8	343 01.5	18.5	13 32.4	28.8	298 44.8	32.5	223 55.9	41.7
D 12	11 42.2	358 05.4	N14 17.8	28 33.0	S 8 28.1	313 46.7	N19 32.7	238 58.4	N18 41.7
A 13	26 44.7	13 09.2	17.0	43 33.6	27.3	328 48.7	32.8	254 00.9	41.7
Y 14	41 47.2	28 13.0	16.2	58 34.3	26.6	343 50.6	32.9	269 03.4	41.7
15	56 49.6	43 16.9	·· 15.4	73 34.9	·· 25.8	358 52.6	·· 33.0	284 05.9	·· 41.7
16	71 52.1	58 20.7	14.6	88 35.6	25.1	13 54.6	33.1	299 08.4	41.7
17	86 54.6	73 24.5	13.8	103 36.2	24.4	28 56.5	33.2	314 10.9	41.7
18	101 57.0	88 28.4	N14 13.0	118 36.8	S 8 23.6	43 58.5	N19 33.3	329 13.4	N18 41.7
19	116 59.5	103 32.2	12.2	133 37.5	22.9	59 00.4	33.4	344 15.9	41.7
20	132 02.0	118 36.1	11.4	148 38.1	22.1	74 02.4	33.5	359 18.4	41.7
21	147 04.4	133 39.9	·· 10.6	163 38.8	·· 21.4	89 04.4	·· 33.6	14 20.9	·· 41.7
22	162 06.9	148 43.7	09.8	178 39.4	20.7	104 06.3	33.8	29 23.4	41.8
23	177 09.4	163 47.6	09.0	193 40.0	19.9	119 08.3	33.9	44 25.9	41.8
Mer. Pass.	h m 11 17.2	v 3.8	d 0.7	v 0.6	d 0.7	v 2.0	d 0.1	v 2.5	d 0.0

STARS

Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 39.4	S40 24.0
Achernar	335 47.6	S57 21.2
Acrux	173 39.1	S62 58.5
Adhara	255 33.9	S28 56.8
Aldebaran	291 20.9	N16 27.7
Alioth	166 44.1	N56 04.9
Alkaid	153 19.9	N49 25.5
Al Na'ir	28 18.3	S47 04.1
Alnilam	276 14.1	S 1 13.2
Alphard	218 22.7	S 8 33.8
Alphecca	126 33.8	N26 47.3
Alpheratz	358 12.1	N28 57.8
Altair	62 34.9	N 8 48.4
Ankaa	353 43.0	S42 25.8
Antares	112 59.5	S26 22.9
Arcturus	146 20.3	N19 17.9
Atria	108 25.6	S68 59.0
Avior	234 28.9	S59 26.6
Bellatrix	279 01.4	N 6 19.6
Betelgeuse	271 30.9	N 7 24.0
Canopus	264 08.3	S52 41.4
Capella	281 14.9	N45 58.6
Deneb	49 50.2	N45 11.7
Denebola	183 01.1	N14 41.8
Diphda	349 23.6	S18 06.8
Dubhe	194 24.5	N61 52.4
Elnath	278 47.2	N28 35.3
Eltanin	90 58.7	N51 29.3
Enif	34 14.1	N 9 46.1
Fomalhaut	15 54.3	S29 44.5
Gacrux	172 30.7	S56 59.3
Gienah	176 20.0	S17 25.1
Hadar	149 26.0	S60 15.8
Hamal	328 31.9	N23 21.2
Kaus Aust.	84 19.9	S34 23.6
Kochab	137 18.0	N74 14.8
Markab	14 05.8	N15 04.9
Menkar	314 43.8	N 3 59.9
Menkent	148 39.4	S36 15.5
Miaplacidus	221 44.8	S69 37.8
Mirfak	309 19.8	N49 46.9
Nunki	76 32.1	S26 19.4
Peacock	54 02.3	S56 48.3
Pollux	244 00.9	N28 04.8
Procyon	245 28.2	N 5 16.8
Rasalhague	96 31.6	N12 34.5
Regulus	208 12.3	N12 04.5
Rigel	281 38.4	S 8 13.9
Rigil Kent.	140 28.3	S60 44.4
Sabik	102 43.7	S15 41.8
Schedar	350 12.2	N56 24.7
Shaula	96 58.8	S37 05.1
Sirius	258 57.8	S16 41.4
Spica	158 59.7	S11 02.7
Suhail	223 12.2	S43 20.8
Vega	80 57.4	N38 45.5
Zuben'ubi	137 35.3	S15 56.9

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	345 34.1	12 14
Mars	17 56.5	10 07
Jupiter	302 22.6	15 08
Saturn	227 14.7	20 07

	G.M.T.	SUN G.H.A.	SUN Dec.	MOON G.H.A.	MOON v	MOON Dec.	MOON d	MOON H.P.
	d h	° ′	° ′	° ′	′	° ′	′	′
	1 00	178 59.4	N 4 24.7	39 26.5	10.8	N 7 41.1	10.0	58.0
	01	193 59.6	25.7	53 56.3	10.7	7 31.1	10.1	58.0
	02	208 59.8	26.6	68 26.0	10.6	7 21.0	10.2	58.0
	03	224 00.0	·· 27.6	82 55.6	10.7	7 10.8	10.2	58.1
	04	239 00.2	28.6	97 25.3	10.6	7 00.6	10.2	58.1
	05	254 00.4	29.5	111 54.9	10.7	6 50.4	10.3	58.2
	06	269 00.6	N 4 30.5	126 24.6	10.5	N 6 40.1	10.4	58.2
	07	284 00.8	31.5	140 54.1	10.6	6 29.7	10.4	58.2
	08	299 00.9	32.4	155 23.7	10.6	6 19.3	10.5	58.3
F	09	314 01.1	·· 33.4	169 53.3	10.5	6 08.8	10.5	58.3
R	10	329 01.3	34.3	184 22.8	10.5	5 58.3	10.5	58.3
I	11	344 01.5	35.3	198 52.3	10.5	5 47.8	10.6	58.4
D	12	359 01.7	N 4 36.3	213 21.8	10.4	N 5 37.2	10.6	58.4
A	13	14 01.9	37.2	227 51.2	10.5	5 26.6	10.7	58.4
Y	14	29 02.1	38.2	242 20.7	10.4	5 15.9	10.7	58.5
	15	44 02.3	·· 39.2	256 50.1	10.4	5 05.2	10.8	58.5
	16	59 02.4	40.1	271 19.5	10.3	4 54.4	10.8	58.6
	17	74 02.6	41.1	285 48.8	10.4	4 43.6	10.9	58.6
	18	89 02.8	N 4 42.1	300 18.2	10.3	N 4 32.7	10.9	58.6
	19	104 03.0	43.0	314 47.5	10.2	4 21.8	10.9	58.7
	20	119 03.2	44.0	329 16.7	10.3	4 10.9	11.0	58.7
	21	134 03.4	·· 44.9	343 46.0	10.2	3 59.9	11.0	58.7
	22	149 03.6	45.9	358 15.2	10.2	3 48.9	11.0	58.8
	23	164 03.8	46.9	12 44.4	10.2	3 37.9	11.1	58.8
	2 00	179 03.9	N 4 47.8	27 13.6	10.1	N 3 26.8	11.1	58.8
	01	194 04.1	48.8	41 42.7	10.1	3 15.7	11.1	58.9
	02	209 04.3	49.8	56 11.8	10.1	3 04.6	11.2	58.9
	03	224 04.5	·· 50.7	70 40.9	10.0	2 53.4	11.2	59.0
	04	239 04.7	51.7	85 09.9	10.1	2 42.2	11.2	59.0
	05	254 04.9	52.6	99 39.0	9.9	2 31.0	11.3	59.0
	06	269 05.1	N 4 53.6	114 07.9	10.0	N 2 19.7	11.2	59.1
	07	284 05.2	54.6	128 36.9	9.9	2 08.5	11.3	59.1
S	08	299 05.4	55.5	143 05.8	9.9	1 57.2	11.4	59.1
A	09	314 05.6	·· 56.5	157 34.7	9.9	1 45.8	11.3	59.2
T	10	329 05.8	57.4	172 03.6	9.8	1 34.5	11.4	59.2
U	11	344 06.0	58.4	186 32.4	9.8	1 23.1	11.4	59.2
R	12	359 06.2	N 4 59.4	201 01.2	9.7	N 1 11.7	11.4	59.3
D	13	14 06.4	5 00.3	215 29.9	9.7	1 00.3	11.5	59.3
A	14	29 06.6	01.3	229 58.6	9.7	0 48.8	11.4	59.3
Y	15	44 06.7	·· 02.2	244 27.3	9.7	0 37.4	11.5	59.4
	16	59 06.9	03.2	258 56.0	9.6	0 25.9	11.5	59.4
	17	74 07.1	04.2	273 24.6	9.6	0 14.4	11.5	59.4
	18	89 07.3	N 5 05.1	287 53.2	9.5	N 0 02.9	11.5	59.4
	19	104 07.5	06.1	302 21.7	9.5	S 0 08.6	11.5	59.5
	20	119 07.7	07.0	316 50.2	9.4	0 20.1	11.6	59.5
	21	134 07.9	·· 08.0	331 18.6	9.5	0 31.7	11.5	59.5
	22	149 08.0	09.0	345 47.1	9.4	0 43.2	11.6	59.6
	23	164 08.2	09.9	0 15.5	9.3	0 54.8	11.5	59.6
	3 00	179 08.4	N 5 10.9	14 43.8	9.3	S 1 06.3	11.6	59.6
	01	194 08.6	11.8	29 12.1	9.3	1 17.9	11.6	59.7
	02	209 08.8	12.8	43 40.4	9.2	1 29.5	11.5	59.7
	03	224 09.0	·· 13.7	58 08.6	9.2	1 41.0	11.6	59.7
	04	239 09.2	14.7	72 36.8	9.1	1 52.6	11.6	59.7
	05	254 09.3	15.7	87 04.9	9.1	2 04.2	11.6	59.8
	06	269 09.5	N 5 16.6	101 33.0	9.1	S 2 15.8	11.5	59.8
	07	284 09.7	17.6	116 01.1	9.0	2 27.3	11.6	59.8
	08	299 09.9	18.5	130 29.1	9.0	2 38.9	11.5	59.9
S	09	314 10.1	·· 19.5	144 57.1	8.9	2 50.4	11.6	59.9
U	10	329 10.3	20.4	159 25.0	8.9	3 02.0	11.5	59.9
N	11	344 10.4	21.4	173 52.9	8.8	3 13.5	11.6	59.9
D	12	359 10.6	N 5 22.4	188 20.7	8.8	S 3 25.1	11.5	60.0
A	13	14 10.8	23.3	202 48.5	8.8	3 36.6	11.5	60.0
Y	14	29 11.0	24.3	217 16.3	8.7	3 48.1	11.5	60.0
	15	44 11.2	·· 25.2	231 44.0	8.7	3 59.6	11.5	60.0
	16	59 11.4	26.2	246 11.7	8.6	4 11.1	11.5	60.1
	17	74 11.6	27.1	260 39.3	8.5	4 22.6	11.4	60.1
	18	89 11.7	N 5 28.1	275 06.8	8.6	S 4 34.0	11.5	60.1
	19	104 11.9	29.1	289 34.4	8.4	4 45.5	11.4	60.1
	20	119 12.1	30.0	304 01.8	8.5	4 56.9	11.4	60.2
	21	134 12.3	·· 31.0	318 29.3	8.4	5 08.3	11.3	60.2
	22	149 12.5	31.9	332 56.7	8.3	5 19.6	11.4	60.2
	23	164 12.7	32.9	347 24.0	8.3	5 31.0	11.3	60.2
		S.D. 16.0	*d* 1.0	S.D. 15.9		16.1		16.3

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 1	Moonrise 2	Moonrise 3	Moonrise 4
°	h m	h m	h m	h m	h m	h m	h m
N 72	01 27	03 36	04 52	14 50	16 44	18 42	20 45
N 70	02 14	03 53	04 59	14 58	16 44	18 35	20 29
68	02 44	04 06	05 06	15 04	16 45	18 29	20 16
66	03 05	04 17	05 11	15 09	16 45	18 24	20 06
64	03 22	04 26	05 16	15 13	16 45	18 20	19 57
62	03 35	04 33	05 19	15 16	16 45	18 17	19 50
60	03 46	04 40	05 23	15 19	16 45	18 13	19 44
N 58	03 56	04 46	05 26	15 22	16 45	18 11	19 38
56	04 04	04 50	05 29	15 25	16 45	18 08	19 33
54	04 11	04 55	05 31	15 27	16 45	18 06	19 29
52	04 17	04 59	05 33	15 29	16 45	18 04	19 25
50	04 23	05 02	05 35	15 31	16 45	18 03	19 21
45	04 34	05 10	05 39	15 35	16 46	17 59	19 13
N 40	04 43	05 16	05 43	15 38	16 46	17 56	19 07
35	04 50	05 20	05 46	15 41	16 46	17 53	19 01
30	04 56	05 24	05 48	15 43	16 46	17 50	18 57
20	05 05	05 31	05 53	15 48	16 46	17 46	18 48
N 10	05 11	05 36	05 57	15 52	16 46	17 43	18 41
0	05 16	05 40	06 00	15 55	16 47	17 39	18 34
S 10	05 18	05 43	06 04	15 59	16 47	17 36	18 28
20	05 20	05 45	06 07	16 03	16 47	17 33	18 21
30	05 19	05 47	06 11	16 07	16 47	17 29	18 13
35	05 19	05 48	06 13	16 09	16 47	17 27	18 08
40	05 17	05 49	06 16	16 12	16 48	17 24	18 03
45	05 15	05 49	06 19	16 16	16 48	17 21	17 57
S 50	05 12	05 50	06 22	16 19	16 48	17 18	17 50
52	05 11	05 50	06 23	16 21	16 48	17 16	17 46
54	05 09	05 50	06 25	16 23	16 49	17 15	17 43
56	05 07	05 50	06 27	16 25	16 49	17 13	17 39
58	05 04	05 50	06 29	16 28	16 49	17 11	17 35
S 60	05 01	05 50	06 31	16 30	16 49	17 08	17 30

Lat.	Sunset	Twilight Civil	Twilight Naut.	Moonset 1	Moonset 2	Moonset 3	Moonset 4
°	h m	h m	h m	h m	h m	h m	h m
N 72	19 19	20 36	22 53	04 57	04 51	04 44	04 37
N 70	19 10	20 18	22 00	04 48	04 47	04 47	04 47
68	19 04	20 04	21 28	04 40	04 45	04 49	04 55
66	18 58	19 53	21 06	04 33	04 42	04 51	05 01
64	18 53	19 44	20 49	04 28	04 41	04 53	05 07
62	18 49	19 36	20 35	04 23	04 39	04 55	05 12
60	18 46	19 29	20 23	04 19	04 37	04 56	05 16
N 58	18 43	19 23	20 14	04 15	04 36	04 57	05 20
56	18 40	19 18	20 05	04 12	04 35	04 58	05 23
54	18 37	19 14	19 58	04 08	04 34	04 59	05 26
52	18 35	19 10	19 51	04 06	04 33	05 00	05 29
50	18 33	19 06	19 46	04 03	04 32	05 01	05 31
45	18 29	18 59	19 34	03 58	04 30	05 03	05 37
N 40	18 25	18 52	19 25	03 53	04 28	05 04	05 41
35	18 22	18 47	19 18	03 49	04 27	05 05	05 45
30	18 19	18 43	19 12	03 46	04 26	05 06	05 49
20	18 15	18 37	19 03	03 39	04 23	05 08	05 55
N 10	18 11	18 32	18 56	03 34	04 21	05 10	06 00
0	18 07	18 28	18 52	03 29	04 19	05 11	06 05
S 10	18 03	18 24	18 49	03 23	04 17	05 13	06 10
20	18 00	18 22	18 47	03 18	04 15	05 15	06 16
30	17 56	18 20	18 47	03 11	04 13	05 16	06 22
35	17 53	18 19	18 48	03 08	04 12	05 17	06 25
40	17 51	18 18	18 49	03 03	04 10	05 19	06 29
45	17 48	18 17	18 51	02 58	04 08	05 20	06 34
S 50	17 44	18 17	18 54	02 53	04 06	05 22	06 40
52	17 43	18 16	18 55	02 50	04 05	05 22	06 42
54	17 41	18 16	18 57	02 47	04 04	05 23	06 45
56	17 39	18 16	18 59	02 43	04 02	05 24	06 48
58	17 37	18 16	19 02	02 40	04 01	05 25	06 52
S 60	17 35	18 16	19 04	02 35	03 59	05 26	06 55

Day	SUN Eqn. of Time 00ʰ	SUN Eqn. of Time 12ʰ	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
	m s	m s	h m	h m	h m	d	
1	04 03	03 54	12 04	22 07	09 42	13	
2	03 45	03 36	12 04	22 59	10 33	14	○
3	03 27	03 18	12 03	23 52	11 25	15	

G.M.T.		ARIES	VENUS −3.2		MARS +1.4		JUPITER −1.6		SATURN +0.4	
		G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
d h		° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
4 00		192 11.8	178 51.4	N14 08.2	208 40.7	S 8 19.2	134 10.2	N19 34.0	59 28.4	N18 41.8
01		207 14.3	193 55.3	07.4	223 41.3	18.4	149 12.2	34.1	74 30.8	41.8
02		222 16.7	208 59.1	06.6	238 42.0	17.7	164 14.1	34.2	89 33.3	41.8
03		237 19.2	224 02.9	·· 05.8	253 42.6	·· 17.0	179 16.1	·· 34.3	104 35.8	·· 41.8
04		252 21.7	239 06.8	04.9	268 43.3	16.2	194 18.1	34.4	119 38.3	41.8
05		267 24.1	254 10.6	04.1	283 43.9	15.5	209 20.0	34.5	134 40.8	41.8
06		282 26.6	269 14.5	N14 03.3	298 44.5	S 8 14.7	224 22.0	N19 34.6	149 43.3	N18 41.8
07		297 29.1	284 18.3	02.5	313 45.2	14.0	239 23.9	34.7	164 45.8	41.8
08		312 31.5	299 22.1	01.7	328 45.8	13.3	254 25.9	34.9	179 48.3	41.8
09	M	327 34.0	314 26.0	·· 00.8	343 46.5	·· 12.5	269 27.8	·· 35.0	194 50.8	·· 41.8
10	O	342 36.5	329 29.8	14 00.0	358 47.1	11.8	284 29.8	35.1	209 53.3	41.9
11	N	357 38.9	344 33.7	13 59.2	13 47.8	11.0	299 31.8	35.2	224 55.8	41.9
12	D	12 41.4	359 37.5	N13 58.4	28 48.4	S 8 10.3	314 33.7	N19 35.3	239 58.3	N18 41.9
13	A	27 43.8	14 41.3	57.5	43 49.1	09.6	329 35.7	35.4	255 00.8	41.9
14	Y	42 46.3	29 45.2	56.7	58 49.7	08.8	344 37.6	35.5	270 03.3	41.9
15		57 48.8	44 49.0	·· 55.9	73 50.3	·· 08.1	359 39.6	·· 35.6	285 05.8	·· 41.9
16		72 51.2	59 52.9	55.0	88 51.0	07.3	14 41.5	35.7	300 08.3	41.9
17		87 53.7	74 56.7	54.2	103 51.6	06.6	29 43.5	35.8	315 10.8	41.9
18		102 56.2	90 00.5	N13 53.3	118 52.3	S 8 05.9	44 45.4	N19 36.0	330 13.3	N18 41.9
19		117 58.6	105 04.4	52.5	133 52.9	05.1	59 47.4	36.1	345 15.8	41.9
20		133 01.1	120 08.2	51.7	148 53.6	04.4	74 49.3	36.2	0 18.3	41.9
21		148 03.6	135 12.1	·· 50.8	163 54.2	·· 03.6	89 51.3	·· 36.3	15 20.8	·· 41.9
22		163 06.0	150 15.9	50.0	178 54.9	02.9	104 53.3	36.4	30 23.2	41.9
23		178 08.5	165 19.7	49.1	193 55.5	02.2	119 55.2	36.5	45 25.7	42.0
5 00		193 11.0	180 23.6	N13 48.3	208 56.1	S 8 01.4	134 57.2	N19 36.6	60 28.2	N18 42.0
01		208 13.4	195 27.4	47.4	223 56.8	8 00.7	149 59.1	36.7	75 30.7	42.0
02		223 15.9	210 31.3	46.6	238 57.4	7 59.9	165 01.1	36.8	90 33.2	42.0
03		238 18.3	225 35.1	·· 45.7	253 58.1	·· 59.2	180 03.0	·· 36.9	105 35.7	·· 42.0
04		253 20.8	240 38.9	44.9	268 58.7	58.4	195 05.0	37.1	120 38.2	42.0
05		268 23.3	255 42.8	44.0	283 59.4	57.7	210 06.9	37.2	135 40.7	42.0
06		283 25.7	270 46.6	N13 43.1	299 00.0	S 7 57.0	225 08.9	N19 37.3	150 43.2	N18 42.0
07		298 28.2	285 50.4	42.3	314 00.7	56.2	240 10.8	37.4	165 45.7	42.0
08	T	313 30.7	300 54.3	41.4	329 01.3	55.5	255 12.8	37.5	180 48.2	42.0
09	U	328 33.1	315 58.1	·· 40.6	344 02.0	·· 54.7	270 14.7	·· 37.6	195 50.7	·· 42.0
10	E	343 35.6	331 02.0	39.7	359 02.6	54.0	285 16.7	37.7	210 53.2	42.0
11	S	358 38.1	346 05.8	38.8	14 03.2	53.2	300 18.6	37.8	225 55.6	42.0
12	D	13 40.5	1 09.6	N13 38.0	29 03.9	S 7 52.5	315 20.6	N19 37.9	240 58.1	N18 42.0
13	A	28 43.0	16 13.5	37.1	44 04.5	51.7	330 22.5	38.0	256 00.6	42.0
14	Y	43 45.5	31 17.3	36.2	59 05.2	51.0	345 24.5	38.1	271 03.1	42.1
15		58 47.9	46 21.1	·· 35.3	74 05.8	·· 50.3	0 26.5	·· 38.3	286 05.6	·· 42.1
16		73 50.4	61 25.0	34.5	89 06.5	49.5	15 28.4	38.4	301 08.1	42.1
17		88 52.8	76 28.8	33.6	104 07.1	48.8	30 30.4	38.5	316 10.6	42.1
18		103 55.3	91 32.6	N13 32.7	119 07.8	S 7 48.0	45 32.3	N19 38.6	331 13.1	N18 42.1
19		118 57.8	106 36.5	31.8	134 08.4	47.3	60 34.3	38.7	346 15.6	42.1
20		134 00.2	121 40.3	30.9	149 09.1	46.5	75 36.2	38.8	1 18.1	42.1
21		149 02.7	136 44.1	·· 30.1	164 09.7	·· 45.8	90 38.2	·· 38.9	16 20.5	·· 42.1
22		164 05.2	151 47.9	29.2	179 10.4	45.1	105 40.1	39.0	31 23.0	42.1
23		179 07.6	166 51.8	28.3	194 11.0	44.3	120 42.1	39.1	46 25.5	42.1
6 00		194 10.1	181 55.6	N13 27.4	209 11.7	S 7 43.6	135 44.0	N19 39.2	61 28.0	N18 42.1
01		209 12.6	196 59.4	26.5	224 12.3	42.8	150 46.0	39.4	76 30.5	42.1
02		224 15.0	212 03.3	25.6	239 13.0	42.1	165 47.9	39.5	91 33.0	42.1
03		239 17.5	227 07.1	·· 24.7	254 13.6	·· 41.3	180 49.9	·· 39.6	106 35.5	·· 42.1
04		254 19.9	242 10.9	23.9	269 14.3	40.6	195 51.8	39.7	121 38.0	42.1
05		269 22.4	257 14.7	23.0	284 14.9	39.8	210 53.8	39.8	136 40.4	42.1
06		284 24.9	272 18.6	N13 22.1	299 15.6	S 7 39.1	225 55.7	N19 39.9	151 42.9	N18 42.2
07	W	299 27.3	287 22.4	21.2	314 16.2	38.3	240 57.7	40.0	166 45.4	42.2
08	E	314 29.8	302 26.2	20.3	329 16.9	37.6	255 59.6	40.1	181 47.9	42.2
09	D	329 32.3	317 30.0	·· 19.4	344 17.5	·· 36.9	271 01.6	·· 40.2	196 50.4	·· 42.2
10	N	344 34.7	332 33.8	18.5	359 18.1	36.1	286 03.5	40.3	211 52.9	42.2
11	E	359 37.2	347 37.7	17.6	14 18.8	35.4	301 05.4	40.5	226 55.4	42.2
12	S	14 39.7	2 41.5	N13 16.7	29 19.4	S 7 34.6	316 07.4	N19 40.6	241 57.9	N18 42.2
13	D	29 42.1	17 45.3	15.8	44 20.1	33.9	331 09.3	40.7	257 00.3	42.2
14	A	44 44.6	32 49.1	14.9	59 20.7	33.1	346 11.3	40.8	272 02.8	42.2
15	Y	59 47.1	47 52.9	·· 14.0	74 21.4	·· 32.4	1 13.2	·· 40.9	287 05.3	·· 42.2
16		74 49.5	62 56.8	13.0	89 22.0	31.6	16 15.2	41.0	302 07.8	42.2
17		89 52.0	78 00.6	12.1	104 22.7	30.9	31 17.1	41.1	317 10.3	42.2
18		104 54.4	93 04.4	N13 11.2	119 23.3	S 7 30.1	46 19.1	N19 41.2	332 12.8	N18 42.2
19		119 56.9	108 08.2	10.3	134 24.0	29.4	61 21.0	41.3	347 15.2	42.2
20		134 59.4	123 12.0	09.4	149 24.6	28.6	76 23.0	41.4	2 17.7	42.2
21		150 01.8	138 15.8	·· 08.5	164 25.3	·· 27.9	91 24.9	·· 41.6	17 20.2	·· 42.2
22		165 04.3	153 19.6	07.6	179 25.9	27.1	106 26.9	41.7	32 22.7	42.2
23		180 06.8	168 23.4	06.7	194 26.6	26.4	121 28.8	41.8	47 25.2	42.2
Mer. Pass.		h m 11 05.4	*v* 3.8	*d* 0.9	*v* 0.6	*d* 0.7	*v* 2.0	*d* 0.1	*v* 2.5	*d* 0.0

STARS		
Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 39.4	S40 24.0
Achernar	335 47.6	S57 21.2
Acrux	173 39.1	S62 58.5
Adhara	255 34.0	S28 56.8
Aldebaran	291 20.9	N16 27.7
Alioth	166 44.1	N56 04.9
Alkaid	153 19.9	N49 25.5
Al Na'ir	28 18.2	S47 04.1
Alnilam	276 14.2	S 1 13.2
Alphard	218 22.7	S 8 33.9
Alphecca	126 33.8	N26 47.3
Alpheratz	358 12.1	N28 57.8
Altair	62 34.9	N 8 48.4
Ankaa	353 43.0	S42 25.8
Antares	112 59.5	S26 22.9
Arcturus	146 20.3	N19 17.9
Atria	108 25.5	S68 59.0
Avior	234 28.9	S59 26.6
Bellatrix	279 01.4	N 6 19.6
Betelgeuse	271 30.9	N 7 24.0
Canopus	264 08.3	S52 41.4
Capella	281 14.9	N45 58.6
Deneb	49 50.2	N45 11.7
Denebola	183 01.1	N14 41.8
Diphda	349 23.6	S18 06.8
Dubhe	194 24.5	N61 52.4
Elnath	278 47.2	N28 35.3
Eltanin	90 58.7	N51 29.3
Enif	34 14.1	N 9 46.2
Fomalhaut	15 54.3	S29 44.5
Gacrux	172 30.7	S56 59.3
Gienah	176 20.0	S17 25.1
Hadar	149 26.0	S60 15.8
Hamal	328 31.9	N23 21.2
Kaus Aust.	84 19.9	S34 23.6
Kochab	137 18.0	N74 14.8
Markab	14 05.8	N15 04.9
Menkar	314 43.8	N 3 59.9
Menkent	148 39.4	S36 15.6
Miaplacidus	221 44.9	S69 37.8
Mirfak	309 19.8	N49 46.9
Nunki	76 32.0	S26 19.4
Peacock	54 02.3	S56 48.2
Pollux	244 01.0	N28 04.8
Procyon	245 28.2	N 5 16.8
Rasalhague	96 31.6	N12 34.5
Regulus	208 12.3	N12 04.6
Rigel	281 38.4	S 8 13.9
Rigil Kent.	140 28.3	S60 44.4
Sabik	102 43.6	S15 41.8
Schedar	350 12.2	N56 24.7
Shaula	96 58.8	S37 05.1
Sirius	258 57.8	S16 41.4
Spica	158 59.7	S11 02.7
Suhail	223 12.2	S43 20.8
Vega	80 57.4	N38 45.5
Zuben'ubi	137 35.3	S15 56.9

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	347 12.6	11 55
Mars	15 45.2	10 04
Jupiter	301 46.2	14 58
Saturn	227 17.3	19 55

	G.M.T.	SUN G.H.A.	SUN Dec.	MOON G.H.A.	MOON v	MOON Dec.	MOON d	MOON H.P.
	d h	° ′	° ′	° ′	′	° ′	′	′
	4 00	179 12.8	N 5 33.8	1 51.3	8.2	S 5 42.3	11.3	60.2
	01	194 13.0	34.8	16 18.5	8.2	5 53.6	11.2	60.3
	02	209 13.2	35.7	30 45.7	8.2	6 04.8	11.2	60.3
	03	224 13.4	·· 36.7	45 12.9	8.1	6 16.0	11.2	60.3
	04	239 13.6	37.6	59 40.0	8.0	6 27.2	11.2	60.3
	05	254 13.8	38.6	74 07.0	8.0	6 38.4	11.1	60.3
	06	269 14.0	N 5 39.5	88 34.0	8.0	S 6 49.5	11.1	60.4
	07	284 14.1	40.5	103 01.0	7.9	7 00.6	11.1	60.4
	08	299 14.3	41.5	117 27.9	7.9	7 11.7	11.0	60.4
M	09	314 14.5	·· 42.4	131 54.8	7.8	7 22.7	10.9	60.4
O	10	329 14.7	43.4	146 21.6	7.7	7 33.6	11.0	60.4
N	11	344 14.9	44.3	160 48.3	7.7	7 44.6	10.9	60.4
D	12	359 15.1	N 5 45.3	175 15.0	7.7	S 7 55.5	10.8	60.5
A	13	14 15.2	46.2	189 41.7	7.6	8 06.3	10.8	60.5
Y	14	29 15.4	47.2	204 08.3	7.6	8 17.1	10.7	60.5
	15	44 15.6	·· 48.1	218 34.9	7.5	8 27.8	10.7	60.5
	16	59 15.8	49.1	233 01.4	7.4	8 38.5	10.7	60.5
	17	74 16.0	50.0	247 27.8	7.4	8 49.2	10.5	60.5
	18	89 16.2	N 5 51.0	261 54.2	7.4	S 8 59.7	10.6	60.5
	19	104 16.3	51.9	276 20.6	7.3	9 10.3	10.5	60.6
	20	119 16.5	52.9	290 46.9	7.3	9 20.8	10.4	60.6
	21	134 16.7	·· 53.8	305 13.2	7.2	9 31.2	10.3	60.6
	22	149 16.9	54.8	319 39.4	7.2	9 41.5	10.3	60.6
	23	164 17.1	55.7	334 05.6	7.1	9 51.8	10.3	60.6
	5 00	179 17.2	N 5 56.7	348 31.7	7.0	S10 02.1	10.2	60.6
	01	194 17.4	57.6	2 57.7	7.1	10 12.3	10.1	60.6
	02	209 17.6	58.6	17 23.8	6.9	10 22.4	10.0	60.6
	03	224 17.8	5 59.5	31 49.7	6.9	10 32.4	10.0	60.6
	04	239 18.0	6 00.5	46 15.6	6.9	10 42.4	9.9	60.6
	05	254 18.2	01.4	60 41.5	6.8	10 52.3	9.9	60.7
	06	269 18.3	N 6 02.4	75 07.3	6.8	S11 02.2	9.7	60.7
	07	284 18.5	03.3	89 33.1	6.7	11 11.9	9.7	60.7
	08	299 18.7	04.3	103 58.8	6.7	11 21.6	9.6	60.7
T	09	314 18.9	·· 05.2	118 24.5	6.6	11 31.2	9.6	60.7
U	10	329 19.1	06.2	132 50.1	6.6	11 40.8	9.5	60.7
E	11	344 19.2	07.1	147 15.7	6.6	11 50.3	9.3	60.7
S	12	359 19.4	N 6 08.1	161 41.3	6.5	S11 59.6	9.4	60.7
D	13	14 19.6	09.0	176 06.8	6.4	12 09.0	9.2	60.7
A	14	29 19.8	10.0	190 32.2	6.4	12 18.2	9.1	60.7
Y	15	44 20.0	·· 10.9	204 57.6	6.4	12 27.3	9.1	60.7
	16	59 20.2	11.9	219 23.0	6.3	12 36.4	9.0	60.7
	17	74 20.3	12.8	233 48.3	6.2	12 45.4	8.9	60.7
	18	89 20.5	N 6 13.8	248 13.5	6.3	S12 54.3	8.8	60.7
	19	104 20.7	14.7	262 38.8	6.1	13 03.1	8.7	60.7
	20	119 20.9	15.7	277 03.9	6.2	13 11.8	8.6	60.7
	21	134 21.1	·· 16.6	291 29.1	6.1	13 20.4	8.5	60.7
	22	149 21.2	17.5	305 54.2	6.0	13 28.9	8.5	60.7
	23	164 21.4	18.5	320 19.2	6.0	13 37.4	8.3	60.7
	6 00	179 21.6	N 6 19.4	334 44.2	6.0	S13 45.7	8.3	60.7
	01	194 21.8	20.4	349 09.2	5.9	13 54.0	8.1	60.7
	02	209 22.0	21.3	3 34.1	5.9	14 02.1	8.1	60.7
	03	224 22.1	·· 22.3	17 59.0	5.9	14 10.2	7.9	60.7
	04	239 22.3	23.2	32 23.9	5.8	14 18.1	7.9	60.7
	05	254 22.5	24.2	46 48.7	5.8	14 26.0	7.7	60.7
	06	269 22.7	N 6 25.1	61 13.5	5.7	S14 33.7	7.7	60.7
W	07	284 22.9	26.1	75 38.2	5.7	14 41.4	7.5	60.7
E	08	299 23.0	27.0	90 02.9	5.7	14 48.9	7.5	60.7
D	09	314 23.2	·· 27.9	104 27.6	5.6	14 56.4	7.3	60.7
N	10	329 23.4	28.9	118 52.2	5.6	15 03.7	7.3	60.7
E	11	344 23.6	29.8	133 16.8	5.6	15 11.0	7.1	60.7
S	12	359 23.8	N 6 30.8	147 41.4	5.5	S15 18.1	7.0	60.7
D	13	14 23.9	31.7	162 05.9	5.5	15 25.1	6.9	60.7
A	14	29 24.1	32.7	176 30.4	5.5	15 32.0	6.8	60.6
Y	15	44 24.3	·· 33.6	190 54.9	5.5	15 38.8	6.7	60.6
	16	59 24.5	34.5	205 19.4	5.4	15 45.5	6.6	60.6
	17	74 24.6	35.5	219 43.8	5.4	15 52.1	6.4	60.6
	18	89 24.8	N 6 36.4	234 08.2	5.4	S15 58.5	6.4	60.6
	19	104 25.0	37.4	248 32.6	5.3	16 04.9	6.2	60.6
	20	119 25.2	38.3	262 56.9	5.3	16 11.1	6.1	60.6
	21	134 25.4	·· 39.3	277 21.2	5.3	16 17.2	6.0	60.6
	22	149 25.5	40.2	291 45.5	5.3	16 23.2	5.9	60.6
	23	164 25.7	41.1	306 09.8	5.2	16 29.1	5.8	60.6
		S.D. 16.0	*d* 0.9	S.D. 16.5		16.5		16.5

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 4	Moonrise 5	Moonrise 6	Moonrise 7
°	h m	h m	h m	h m	h m	h m	h m
N 72	00 20	03 17	04 36	20 45	22 55	25 17	01 17
N 70	01 47	03 36	04 45	20 29	22 26	24 23	00 23
68	02 24	03 52	04 53	20 16	22 05	23 50	25 22
66	02 49	04 04	04 59	20 06	21 48	23 26	24 52
64	03 08	04 14	05 05	19 57	21 34	23 07	24 29
62	03 23	04 23	05 10	19 50	21 23	22 52	24 11
60	03 35	04 30	05 14	19 44	21 13	22 39	23 56
N 58	03 46	04 37	05 17	19 38	21 05	22 28	23 43
56	03 55	04 42	05 21	19 33	20 58	22 19	23 33
54	04 03	04 47	05 24	19 29	20 51	22 10	23 23
52	04 10	04 52	05 26	19 25	20 45	22 03	23 14
50	04 16	04 56	05 29	19 21	20 40	21 56	23 07
45	04 28	05 04	05 34	19 13	20 28	21 42	22 50
N 40	04 38	05 11	05 38	19 07	20 19	21 30	22 37
35	04 46	05 16	05 42	19 01	20 11	21 20	22 25
30	04 52	05 21	05 45	18 57	20 04	21 11	22 16
20	05 02	05 28	05 50	18 48	19 52	20 56	21 58
N 10	05 09	05 34	05 55	18 41	19 41	20 42	21 44
0	05 15	05 39	05 59	18 34	19 31	20 30	21 30
S 10	05 18	05 43	06 04	18 28	19 22	20 18	21 16
20	05 20	05 46	06 08	18 21	19 11	20 05	21 01
30	05 21	05 49	06 13	18 13	18 59	19 50	20 45
35	05 21	05 50	06 16	18 08	18 53	19 42	20 35
40	05 20	05 52	06 19	18 03	18 45	19 32	20 24
45	05 19	05 53	06 22	17 57	18 36	19 20	20 11
S 50	05 17	05 54	06 27	17 50	18 26	19 07	19 55
52	05 16	05 55	06 28	17 46	18 21	19 00	19 48
54	05 14	05 55	06 31	17 43	18 15	18 53	19 39
56	05 13	05 56	06 33	17 39	18 09	18 46	19 30
58	05 11	05 56	06 35	17 35	18 03	18 37	19 20
S 60	05 08	05 57	06 38	17 30	17 55	18 27	19 08

Lat.	Sunset	Twilight Civil	Twilight Naut.	Moonset 4	Moonset 5	Moonset 6	Moonset 7
°	h m	h m	h m	h m	h m	h m	h m
N 72	19 33	20 54	////	04 37	04 30	04 20	04 02
N 70	19 23	20 33	22 27	04 47	04 47	04 50	04 57
68	19 15	20 17	21 47	04 55	05 02	05 12	05 30
66	19 08	20 04	21 21	05 01	05 13	05 30	05 55
64	19 02	19 53	21 01	05 07	05 23	05 44	06 14
62	18 57	19 45	20 45	05 12	05 31	05 56	06 29
60	18 53	19 37	20 33	05 16	05 39	06 07	06 43
N 58	18 49	19 30	20 22	05 20	05 45	06 16	06 54
56	18 46	19 25	20 12	05 23	05 51	06 24	07 04
54	18 43	19 20	20 04	05 26	05 56	06 31	07 13
52	18 40	19 15	19 57	05 29	06 01	06 37	07 21
50	18 38	19 11	19 51	05 31	06 05	06 43	07 28
45	18 33	19 02	19 38	05 37	06 14	06 55	07 43
N 40	18 28	18 56	19 28	05 41	06 22	07 06	07 55
35	18 24	18 50	19 20	05 45	06 28	07 15	08 06
30	18 21	18 45	19 14	05 49	06 34	07 23	08 15
20	18 15	18 38	19 03	05 55	06 44	07 36	08 31
N 10	18 10	18 32	18 56	06 00	06 53	07 48	08 45
0	18 06	18 27	18 51	06 05	07 01	07 59	08 58
S 10	18 02	18 23	18 47	06 10	07 09	08 10	09 12
20	17 57	18 19	18 45	06 16	07 18	08 22	09 26
30	17 52	18 16	18 44	06 22	07 29	08 36	09 42
35	17 49	18 15	18 44	06 25	07 34	08 44	09 51
40	17 46	18 13	18 44	06 29	07 41	08 53	10 02
45	17 42	18 12	18 46	06 34	07 49	09 03	10 14
S 50	17 38	18 10	18 48	06 40	07 58	09 16	10 30
52	17 36	18 10	18 49	06 42	08 03	09 22	10 37
54	17 34	18 09	18 50	06 45	08 07	09 29	10 45
56	17 32	18 09	18 52	06 48	08 13	09 36	10 54
58	17 29	18 08	18 53	06 52	08 19	09 44	11 04
S 60	17 26	18 07	18 56	06 55	08 26	09 54	11 16

Day	SUN Eqn. of Time 00ʰ	SUN Eqn. of Time 12ʰ	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
	m s	m s	h m	h m	h m	d	
4	03 09	03 00	12 03	24 48	12 20	16	
5	02 51	02 43	12 03	00 48	13 16	17	○
6	02 34	02 25	12 02	01 45	14 15	18	

1977 APRIL 7, 8, 9 (THURS., FRI., SAT.)

G.M.T.	ARIES	VENUS −3.2		MARS +1.4		JUPITER −1.6		SATURN +0.4		STARS		
	G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	Name	S.H.A.	Dec.
d h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	° ′
7 00	195 09.2	183 27.2	N13 05.7	209 27.3	S 7 25.6	136 30.8	N19 41.9	62 27.7	N18 42.2	Acamar	315 39.4	S40 24.0
01	210 11.7	198 31.1	04.8	224 27.9	24.9	151 32.7	42.0	77 30.2	42.2	Achernar	335 47.7	S57 21.2
02	225 14.2	213 34.9	03.9	239 28.6	24.2	166 34.7	42.1	92 32.6	42.3	Acrux	173 39.1	S62 58.6
03	240 16.6	228 38.7	·· 03.0	254 29.2	·· 23.4	181 36.6	·· 42.2	107 35.1	·· 42.3	Adhara	255 34.0	S28 56.8
04	255 19.1	243 42.5	02.1	269 29.9	22.7	196 38.6	42.3	122 37.6	42.3	Aldebaran	291 20.9	N16 27.7
05	270 21.6	258 46.3	01.1	284 30.5	21.9	211 40.5	42.4	137 40.1	42.3			
06	285 24.0	273 50.1	N13 00.2	299 31.2	S 7 21.2	226 42.4	N19 42.5	152 42.6	N18 42.3	Alioth	166 44.1	N56 04.9
07	300 26.5	288 53.9	12 59.3	314 31.8	20.4	241 44.4	42.7	167 45.0	42.3	Alkaid	153 19.9	N49 25.5
T 08	315 28.9	303 57.7	58.4	329 32.5	19.7	256 46.3	42.8	182 47.5	42.3	Al Na'ir	28 18.2	S47 04.1
H 09	330 31.4	319 01.5	·· 57.4	344 33.1	·· 18.9	271 48.3	·· 42.9	197 50.0	·· 42.3	Alnilam	276 14.2	S 1 13.2
U 10	345 33.9	334 05.3	56.5	359 33.8	18.2	286 50.2	43.0	212 52.5	42.3	Alphard	218 22.7	S 8 33.9
R 11	0 36.3	349 09.1	55.6	14 34.4	17.4	301 52.2	43.1	227 55.0	42.3			
S 12	15 38.8	4 12.9	N12 54.6	29 35.1	S 7 16.7	316 54.1	N19 43.2	242 57.5	N18 42.3	Alphecca	126 33.8	N26 47.3
D 13	30 41.3	19 16.6	53.7	44 35.7	15.9	331 56.1	43.3	257 59.9	42.3	Alpheratz	358 12.0	N28 57.8
A 14	45 43.7	34 20.4	52.8	59 36.4	15.2	346 58.0	43.4	273 02.4	42.3	Altair	62 34.8	N 8 48.4
Y 15	60 46.2	49 24.2	·· 51.8	74 37.0	·· 14.4	1 59.9	·· 43.5	288 04.9	·· 42.3	Ankaa	353 43.0	S42 25.8
16	75 48.7	64 28.0	50.9	89 37.7	13.7	17 01.9	43.6	303 07.4	42.3	Antares	112 59.5	S26 22.9
17	90 51.1	79 31.8	50.0	104 38.3	12.9	32 03.8	43.8	318 09.9	42.3			
18	105 53.6	94 35.6	N12 49.0	119 39.0	S 7 12.2	47 05.8	N19 43.9	333 12.3	N18 42.3	Arcturus	146 20.3	N19 17.9
19	120 56.0	109 39.4	48.1	134 39.6	11.4	62 07.7	44.0	348 14.8	42.3	Atria	108 25.5	S68 59.0
20	135 58.5	124 43.2	47.1	149 40.3	10.7	77 09.7	44.1	3 17.3	42.3	Avior	234 28.9	S59 26.6
21	151 01.0	139 46.9	·· 46.2	164 40.9	·· 09.9	92 11.6	·· 44.2	18 19.8	·· 42.3	Bellatrix	279 01.4	N 6 19.6
22	166 03.4	154 50.7	45.3	179 41.6	09.2	107 13.6	44.3	33 22.3	42.3	Betelgeuse	271 30.9	N 7 24.0
23	181 05.9	169 54.5	44.3	194 42.2	08.4	122 15.5	44.4	48 24.7	42.3			
8 00	196 08.4	184 58.3	N12 43.4	209 42.9	S 7 07.7	137 17.4	N19 44.5	63 27.2	N18 42.3	Canopus	264 08.4	S52 41.4
01	211 10.8	200 02.1	42.4	224 43.6	06.9	152 19.4	44.6	78 29.7	42.3	Capella	281 15.0	N45 58.6
02	226 13.3	215 05.8	41.5	239 44.2	06.2	167 21.3	44.7	93 32.2	42.3	Deneb	49 50.2	N45 11.7
03	241 15.8	230 09.6	·· 40.5	254 44.9	·· 05.4	182 23.3	·· 44.9	108 34.7	·· 42.4	Denebola	183 01.1	N14 41.8
04	256 18.2	245 13.4	39.6	269 45.5	04.7	197 25.2	45.0	123 37.1	42.4	Diphda	349 23.5	S18 06.8
05	271 20.7	260 17.2	38.6	284 46.2	03.9	212 27.2	45.1	138 39.6	42.4			
06	286 23.2	275 20.9	N12 37.7	299 46.8	S 7 03.2	227 29.1	N19 45.2	153 42.1	N18 42.4	Dubhe	194 24.5	N61 52.5
07	301 25.6	290 24.7	36.7	314 47.5	02.4	242 31.0	45.3	168 44.6	42.4	Elnath	278 47.2	N28 35.3
08	316 28.1	305 28.5	35.8	329 48.1	01.7	257 33.0	45.4	183 47.0	42.4	Eltanin	90 58.6	N51 29.3
F 09	331 30.5	320 32.2	·· 34.8	344 48.8	·· 00.9	272 34.9	·· 45.5	198 49.5	·· 42.4	Enif	34 14.0	N 9 46.2
R 10	346 33.0	335 36.0	33.9	359 49.4	7 00.2	287 36.9	45.6	213 52.0	42.4	Fomalhaut	15 54.3	S29 44.5
I 11	1 35.5	350 39.8	32.9	14 50.1	6 59.4	302 38.8	45.7	228 54.5	42.4			
D 12	16 37.9	5 43.5	N12 32.0	29 50.8	S 6 58.7	317 40.7	N19 45.8	243 57.0	N18 42.4	Gacrux	172 30.7	S56 59.3
A 13	31 40.4	20 47.3	31.0	44 51.4	57.9	332 42.7	46.0	258 59.4	42.4	Gienah	176 20.0	S17 25.1
Y 14	46 42.9	35 51.0	30.1	59 52.1	57.2	347 44.6	46.1	274 01.9	42.4	Hadar	149 25.9	S60 15.8
15	61 45.3	50 54.8	·· 29.1	74 52.7	·· 56.4	2 46.6	·· 46.2	289 04.4	·· 42.4	Hamal	328 31.9	N23 21.2
16	76 47.8	65 58.5	28.2	89 53.4	55.7	17 48.5	46.3	304 06.9	42.4	Kaus Aust.	84 19.8	S34 23.6
17	91 50.3	81 02.3	27.2	104 54.0	54.9	32 50.5	46.4	319 09.3	42.4			
18	106 52.7	96 06.0	N12 26.2	119 54.7	S 6 54.2	47 52.4	N19 46.5	334 11.8	N18 42.4	Kochab	137 18.0	N74 14.8
19	121 55.2	111 09.8	25.3	134 55.3	53.4	62 54.3	46.6	349 14.3	42.4	Markab	14 05.7	N15 04.9
20	136 57.7	126 13.5	24.3	149 56.0	52.7	77 56.3	46.7	4 16.8	42.4	Menkar	314 43.8	N 3 59.9
21	152 00.1	141 17.3	·· 23.4	164 56.7	·· 51.9	92 58.2	·· 46.8	19 19.2	·· 42.4	Menkent	148 39.3	S36 15.6
22	167 02.6	156 21.0	22.4	179 57.3	51.2	108 00.2	46.9	34 21.7	42.4	Miaplacidus	221 44.9	S69 37.8
23	182 05.0	171 24.8	21.4	194 58.0	50.4	123 02.1	47.1	49 24.2	42.4			
9 00	197 07.5	186 28.5	N12 20.5	209 58.6	S 6 49.6	138 04.0	N19 47.2	64 26.7	N18 42.4	Mirfak	309 19.8	N49 46.9
01	212 10.0	201 32.2	19.5	224 59.3	48.9	153 06.0	47.3	79 29.1	42.4	Nunki	76 32.0	S26 19.4
02	227 12.4	216 36.0	18.5	239 59.9	48.1	168 07.9	47.4	94 31.6	42.4	Peacock	54 02.3	S56 48.2
03	242 14.9	231 39.7	·· 17.6	255 00.6	·· 47.4	183 09.9	·· 47.5	109 34.1	·· 42.4	Pollux	244 01.0	N28 04.8
04	257 17.4	246 43.4	16.6	270 01.2	46.6	198 11.8	47.6	124 36.6	42.4	Procyon	245 28.2	N 5 16.8
05	272 19.8	261 47.2	15.6	285 01.9	45.9	213 13.7	47.7	139 39.0	42.4			
06	287 22.3	276 50.9	N12 14.7	300 02.6	S 6 45.1	228 15.7	N19 47.8	154 41.5	N18 42.4	Rasalhague	96 31.6	N12 34.5
07	302 24.8	291 54.6	13.7	315 03.2	44.4	243 17.6	47.9	169 44.0	42.4	Regulus	208 12.3	N12 04.6
S 08	317 27.2	306 58.4	12.7	330 03.9	43.6	258 19.5	48.0	184 46.5	42.4	Rigel	281 38.4	S 8 13.9
A 09	332 29.7	322 02.1	·· 11.8	345 04.5	·· 42.9	273 21.5	·· 48.1	199 48.9	·· 42.4	Rigil Kent.	140 28.3	S60 44.4
T 10	347 32.1	337 05.8	10.8	0 05.2	42.1	288 23.4	48.3	214 51.4	42.4	Sabik	102 43.6	S15 41.8
U 11	2 34.6	352 09.5	09.8	15 05.8	41.4	303 25.4	48.4	229 53.9	42.4			
R 12	17 37.1	7 13.2	N12 08.9	30 06.5	S 6 40.6	318 27.3	N19 48.5	244 56.3	N18 42.4	Schedar	350 12.1	N56 24.7
D 13	32 39.5	22 17.0	07.9	45 07.2	39.9	333 29.2	48.6	259 58.8	42.4	Shaula	96 58.7	S37 05.1
A 14	47 42.0	37 20.7	06.9	60 07.8	39.1	348 31.2	48.7	275 01.3	42.4	Sirius	258 57.8	S16 41.4
Y 15	62 44.5	52 24.4	·· 05.9	75 08.5	·· 38.3	3 33.1	·· 48.8	290 03.8	·· 42.4	Spica	158 59.7	S11 02.7
16	77 46.9	67 28.1	05.0	90 09.1	37.6	18 35.0	48.9	305 06.2	42.4	Suhail	223 12.3	S43 20.8
17	92 49.4	82 31.8	04.0	105 09.8	36.8	33 37.0	49.0	320 08.7	42.4			
18	107 51.9	97 35.5	N12 03.0	120 10.4	S 6 36.1	48 38.9	N19 49.1	335 11.2	N18 42.4	Vega	80 57.3	N38 45.5
19	122 54.3	112 39.2	02.0	135 11.1	35.3	63 40.9	49.2	350 13.6	42.4	Zuben'ubi	137 35.3	S15 56.9
20	137 56.8	127 42.9	01.1	150 11.8	34.6	78 42.8	49.4	5 16.1	42.4			
21	152 59.3	142 46.6	12 00.1	165 12.4	·· 33.8	93 44.7	·· 49.5	20 18.6	·· 42.4			
22	168 01.7	157 50.3	11 59.1	180 13.1	33.1	108 46.7	49.6	35 21.1	42.4			
23	183 04.2	172 54.0	58.1	195 13.7	32.3	123 48.6	49.7	50 23.5	42.4			
	h m											
Mer. Pass.	10 53.7	v 3.8	d 1.0	v 0.7	d 0.8	v 1.9	d 0.1	v 2.5	d 0.0			

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	348 49.9	11 37
Mars	13 34.5	10 01
Jupiter	301 09.1	14 49
Saturn	227 18.9	19 43

G.M.T.	SUN G.H.A.	SUN Dec.	MOON G.H.A.	MOON v	MOON Dec.	MOON d	MOON H.P.
d h	° ′	° ′	° ′	′	° ′	′	′
7 00	179 25.9	N 6 42.1	320 34.0	5.3	S16 34.9	5.6	60.5
01	194 26.1	43.0	334 58.3	5.2	16 40.5	5.5	60.5
02	209 26.3	44.0	349 22.5	5.2	16 46.0	5.4	60.5
03	224 26.4	· · 44.9	3 46.7	5.2	16 51.4	5.3	60.5
04	239 26.6	45.8	18 10.9	5.1	16 56.7	5.2	60.5
05	254 26.8	46.8	32 35.0	5.2	17 01.9	5.0	60.5
06	269 27.0	N 6 47.7	46 59.2	5.1	S17 06.9	4.9	60.5
07	284 27.1	48.7	61 23.3	5.1	17 11.8	4.8	60.5
T 08	299 27.3	49.6	75 47.4	5.2	17 16.6	4.7	60.4
H 09	314 27.5	· · 50.5	90 11.6	5.1	17 21.3	4.5	60.4
U 10	329 27.7	51.5	104 35.7	5.1	17 25.8	4.5	60.4
R 11	344 27.9	52.4	118 59.8	5.0	17 30.3	4.3	60.4
S 12	359 28.0	N 6 53.4	133 23.8	5.1	S17 34.6	4.1	60.4
D 13	14 28.2	54.3	147 47.9	5.1	17 38.7	4.1	60.4
A 14	29 28.4	55.2	162 12.0	5.1	17 42.8	3.9	60.3
Y 15	44 28.6	· · 56.2	176 36.1	5.0	17 46.7	3.8	60.3
16	59 28.7	57.1	191 00.1	5.1	17 50.5	3.6	60.3
17	74 28.9	58.1	205 24.2	5.1	17 54.1	3.6	60.3
18	89 29.1	N 6 59.0	219 48.3	5.0	S17 57.7	3.4	60.3
19	104 29.3	6 59.9	234 12.3	5.1	18 01.1	3.2	60.3
20	119 29.4	7 00.9	248 36.4	5.1	18 04.3	3.2	60.2
21	134 29.6	· · 01.8	263 00.5	5.1	18 07.5	3.0	60.2
22	149 29.8	02.7	277 24.6	5.0	18 10.5	2.9	60.2
23	164 30.0	03.7	291 48.6	5.1	18 13.4	2.8	60.2
8 00	179 30.1	N 7 04.6	306 12.7	5.1	S18 16.2	2.6	60.2
01	194 30.3	05.6	320 36.8	5.1	18 18.8	2.5	60.1
02	209 30.5	06.5	335 00.9	5.2	18 21.3	2.4	60.1
03	224 30.7	· · 07.4	349 25.1	5.1	18 23.7	2.2	60.1
04	239 30.8	08.4	3 49.2	5.1	18 25.9	2.1	60.1
05	254 31.0	09.3	18 13.3	5.2	18 28.0	2.0	60.1
06	269 31.2	N 7 10.2	32 37.5	5.2	S18 30.0	1.8	60.0
07	284 31.4	11.2	47 01.7	5.2	18 31.8	1.8	60.0
08	299 31.5	12.1	61 25.9	5.2	18 33.6	1.6	60.0
F 09	314 31.7	· · 13.0	75 50.1	5.2	18 35.2	1.4	60.0
R 10	329 31.9	14.0	90 14.3	5.3	18 36.6	1.3	59.9
I 11	344 32.1	14.9	104 38.6	5.2	18 37.9	1.2	59.9
D 12	359 32.2	N 7 15.8	119 02.8	5.3	S18 39.1	1.1	59.9
A 13	14 32.4	16.8	133 27.1	5.4	18 40.2	1.0	59.9
Y 14	29 32.6	17.7	147 51.5	5.3	18 41.2	0.8	59.8
15	44 32.8	· · 18.6	162 15.8	5.4	18 42.0	0.7	59.8
16	59 32.9	19.6	176 40.2	5.4	18 42.7	0.5	59.8
17	74 33.1	20.5	191 04.6	5.4	18 43.2	0.4	59.8
18	89 33.3	N 7 21.4	205 29.0	5.5	S18 43.6	0.3	59.8
19	104 33.5	22.4	219 53.5	5.5	18 43.9	0.2	59.7
20	119 33.6	23.3	234 18.0	5.5	18 44.1	0.1	59.7
21	134 33.8	· · 24.2	248 42.5	5.6	18 44.2	0.1	59.7
22	149 34.0	25.2	263 07.1	5.6	18 44.1	0.2	59.7
23	164 34.1	26.1	277 31.7	5.6	18 43.9	0.4	59.6
9 00	179 34.3	N 7 27.0	291 56.3	5.7	S18 43.5	0.4	59.6
01	194 34.5	28.0	306 21.0	5.7	18 43.1	0.6	59.6
02	209 34.7	28.9	320 45.7	5.8	18 42.5	0.7	59.6
03	224 34.8	· · 29.8	335 10.5	5.8	18 41.8	0.9	59.5
04	239 35.0	30.8	349 35.3	5.8	18 40.9	0.9	59.5
05	254 35.2	31.7	4 00.1	5.9	18 40.0	1.1	59.5
06	269 35.4	N 7 32.6	18 25.0	5.9	S18 38.9	1.2	59.4
07	284 35.5	33.5	32 49.9	6.0	18 37.7	1.4	59.4
S 08	299 35.7	34.5	47 14.9	6.0	18 36.3	1.4	59.4
A 09	314 35.9	· · 35.4	61 39.9	6.1	18 34.9	1.6	59.4
T 10	329 36.0	36.3	76 05.0	6.1	18 33.3	1.7	59.3
U 11	344 36.2	37.3	90 30.1	6.1	18 31.6	1.8	59.3
R 12	359 36.4	N 7 38.2	104 55.2	6.2	S18 29.8	1.9	59.3
D 13	14 36.6	39.1	119 20.4	6.3	18 27.9	2.1	59.3
A 14	29 36.7	40.0	133 45.7	6.3	18 25.8	2.2	59.2
Y 15	44 36.9	· · 41.0	148 11.0	6.3	18 23.6	2.3	59.2
16	59 37.1	41.9	162 36.3	6.5	18 21.3	2.4	59.2
17	74 37.2	42.8	177 01.8	6.4	18 18.9	2.5	59.1
18	89 37.4	N 7 43.8	191 27.2	6.5	S18 16.4	2.6	59.1
19	104 37.6	44.7	205 52.7	6.6	18 13.8	2.8	59.1
20	119 37.8	45.6	220 18.3	6.7	18 11.0	2.9	59.1
21	134 37.9	· · 46.5	234 44.0	6.6	18 08.1	2.9	59.0
22	149 38.1	47.5	249 09.6	6.8	18 05.2	3.1	59.0
23	164 38.3	48.4	263 35.4	6.8	18 02.1	3.3	59.0
	S.D. 16.0	d 0.9	S.D. 16.5		16.3		16.2

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 7	Moonrise 8	Moonrise 9	Moonrise 10
°	h m	h m	h m	h m	h m	h m	h m
N 72	////	02 56	04 19	01 17	▬	▬	05 07
N 70	01 11	03 19	04 31	00 23	02 08	03 19	03 47
68	02 01	03 37	04 40	25 22	01 22	02 29	03 08
66	02 31	03 51	04 48	24 52	00 52	01 57	02 41
64	02 53	04 03	04 54	24 29	00 29	01 34	02 20
62	03 10	04 12	05 00	24 11	00 11	01 15	02 04
60	03 24	04 21	05 05	23 56	25 00	01 00	01 49
N 58	03 36	04 28	05 09	23 43	24 47	00 47	01 37
56	03 46	04 34	05 13	23 33	24 36	00 36	01 27
54	03 54	04 40	05 16	23 23	24 26	00 26	01 18
52	04 02	04 44	05 19	23 14	24 17	00 17	01 09
50	04 08	04 49	05 22	23 07	24 09	00 09	01 02
45	04 22	04 58	05 28	22 50	23 52	24 46	00 46
N 40	04 33	05 06	05 33	22 37	23 38	24 33	00 33
35	04 42	05 12	05 38	22 25	23 27	24 22	00 22
30	04 49	05 17	05 41	22 16	23 16	24 12	00 12
20	05 00	05 26	05 48	21 58	22 59	23 56	24 48
N 10	05 08	05 32	05 53	21 44	22 44	23 41	24 35
0	05 14	05 38	05 59	21 30	22 29	23 27	24 23
S 10	05 18	05 42	06 04	21 16	22 15	23 14	24 11
20	05 21	05 47	06 09	21 01	22 00	22 59	23 58
30	05 23	05 51	06 15	20 45	21 42	22 42	23 43
35	05 23	05 53	06 18	20 35	21 32	22 33	23 34
40	05 23	05 55	06 22	20 24	21 21	22 21	23 24
45	05 23	05 57	06 26	20 11	21 07	22 08	23 13
S 50	05 21	05 59	06 31	19 55	20 51	21 52	22 59
52	05 21	06 00	06 34	19 48	20 43	21 45	22 52
54	05 20	06 01	06 36	19 39	20 34	21 37	22 45
56	05 18	06 01	06 39	19 30	20 24	21 27	22 37
58	05 17	06 03	06 42	19 20	20 13	21 17	22 28
S 60	05 15	06 04	06 45	19 08	20 01	21 05	22 17

Lat.	Sunset	Twilight Civil	Twilight Naut.	Moonset 7	Moonset 8	Moonset 9	Moonset 10
°	h m	h m	h m	h m	h m	h m	h m
N 72	19 48	21 13	////	04 02	▬	▬	06 22
N 70	19 36	20 49	23 07	04 57	05 16	06 10	07 41
68	19 26	20 30	22 09	05 30	06 03	06 59	08 20
66	19 18	20 15	21 37	05 55	06 33	07 31	08 46
64	19 11	20 03	21 14	06 14	06 56	07 54	09 07
62	19 06	19 53	20 57	06 29	07 14	08 13	09 23
60	19 01	19 45	20 42	06 43	07 29	08 28	09 37
N 58	18 56	19 38	20 30	06 54	07 42	08 41	09 49
56	18 52	19 31	20 20	07 04	07 53	08 52	09 59
54	18 49	19 26	20 11	07 13	08 03	09 02	10 08
52	18 45	19 21	20 03	07 21	08 12	09 11	10 16
50	18 43	19 16	19 57	07 28	08 20	09 19	10 23
45	18 36	19 06	19 43	07 43	08 36	09 35	10 38
N 40	18 31	18 59	19 32	07 55	08 50	09 49	10 51
35	18 27	18 52	19 23	08 06	09 01	10 01	11 02
30	18 23	18 47	19 16	08 15	09 12	10 11	11 11
20	18 16	18 38	19 04	08 31	09 29	10 28	11 27
N 10	18 10	18 32	18 56	08 45	09 44	10 43	11 41
0	18 05	18 26	18 50	08 58	09 58	10 57	11 54
S 10	18 00	18 21	18 46	09 12	10 12	11 11	12 07
20	17 55	18 17	18 42	09 26	10 28	11 26	12 21
30	17 49	18 13	18 40	09 42	10 45	11 43	12 37
35	17 45	18 11	18 40	09 51	10 55	11 53	12 46
40	17 41	18 08	18 40	10 02	11 07	12 05	12 56
45	17 37	18 06	18 40	10 14	11 20	12 18	13 08
S 50	17 32	18 04	18 41	10 30	11 37	12 34	13 23
52	17 29	18 03	18 42	10 37	11 44	12 42	13 30
54	17 27	18 02	18 43	10 45	11 53	12 51	13 37
56	17 24	18 01	18 44	10 54	12 03	13 00	13 46
58	17 21	18 00	18 45	11 04	12 14	13 11	13 56
S 60	17 17	17 59	18 47	11 16	12 26	13 23	14 06

Day	SUN Eqn. of Time 00ʰ	SUN Eqn. of Time 12ʰ	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
	m s	m s	h m	h m	h m	d	
7	02 17	02 08	12 02	02 44	15 14	19	
8	02 00	01 51	12 02	03 44	16 14	20	◑
9	01 43	01 35	12 02	04 43	17 12	21	

1977 APRIL 10, 11, 12 (SUN., MON., TUES.)

G.M.T.		ARIES	VENUS −3.4		MARS +1.4		JUPITER −1.6		SATURN +0.4	
d	h	G.H.A. ° ′	G.H.A. ° ′	Dec. ° ′	G.H.A. ° ′	Dec. ° ′	G.H.A. ° ′	Dec. ° ′	G.H.A. ° ′	Dec. ° ′
10	00	198 06.6	187 57.7	N11 57.2	210 14.4	S 6 31.6	138 50.5	N19 49.8	65 26.0	N18 42.4
	01	213 09.1	203 01.4	56.2	225 15.1	30.8	153 52.5	49.9	80 28.5	42.4
	02	228 11.6	218 05.1	55.2	240 15.7	30.1	168 54.4	50.0	95 30.9	42.4
	03	243 14.0	233 08.8	·· 54.2	255 16.4	·· 29.3	183 56.4	·· 50.1	110 33.4	·· 42.4
	04	258 16.5	248 12.4	53.2	270 17.0	28.5	198 58.3	50.2	125 35.9	42.4
	05	273 19.0	263 16.1	52.3	285 17.7	27.8	214 00.2	50.3	140 38.3	42.4
	06	288 21.4	278 19.8	N11 51.3	300 18.4	S 6 27.0	229 02.2	N19 50.5	155 40.8	N18 42.4
	07	303 23.9	293 23.5	50.3	315 19.0	26.3	244 04.1	50.6	170 43.3	42.4
	08	318 26.4	308 27.2	49.3	330 19.7	25.5	259 06.0	50.7	185 45.7	42.4
SUNDAY	09	333 28.8	323 30.8	·· 48.3	345 20.3	·· 24.8	274 08.0	·· 50.8	200 48.2	·· 42.4
	10	348 31.3	338 34.5	47.4	0 21.0	24.0	289 09.9	50.9	215 50.7	42.4
	11	3 33.8	353 38.2	46.4	15 21.7	23.3	304 11.8	51.0	230 53.2	42.4
	12	18 36.2	8 41.8	N11 45.4	30 22.3	S 6 22.5	319 13.8	N19 51.1	245 55.6	N18 42.4
	13	33 38.7	23 45.5	44.4	45 23.0	21.7	334 15.7	51.2	260 58.1	42.4
	14	48 41.1	38 49.2	43.4	60 23.6	21.0	349 17.6	51.3	276 00.6	42.4
	15	63 43.6	53 52.8	·· 42.4	75 24.3	·· 20.2	4 19.6	·· 51.4	291 03.0	·· 42.4
	16	78 46.1	68 56.5	41.5	90 25.0	19.5	19 21.5	51.5	306 05.5	42.4
	17	93 48.5	84 00.1	40.5	105 25.6	18.7	34 23.4	51.7	321 08.0	42.4
	18	108 51.0	99 03.8	N11 39.5	120 26.3	S 6 18.0	49 25.4	N19 51.8	336 10.4	N18 42.4
	19	123 53.5	114 07.4	38.5	135 26.9	17.2	64 27.3	51.9	351 12.9	42.4
	20	138 55.9	129 11.1	37.5	150 27.6	16.5	79 29.2	52.0	6 15.4	42.4
	21	153 58.4	144 14.7	·· 36.5	165 28.3	·· 15.7	94 31.2	·· 52.1	21 17.8	·· 42.4
	22	169 00.9	159 18.4	35.6	180 28.9	14.9	109 33.1	52.2	36 20.3	42.4
	23	184 03.3	174 22.0	34.6	195 29.6	14.2	124 35.0	52.3	51 22.8	42.4
11	00	199 05.8	189 25.7	N11 33.6	210 30.2	S 6 13.4	139 37.0	N19 52.4	66 25.2	N18 42.4
	01	214 08.2	204 29.3	32.6	225 30.9	12.7	154 38.9	52.5	81 27.7	42.4
	02	229 10.7	219 32.9	31.6	240 31.6	11.9	169 40.8	52.6	96 30.1	42.4
	03	244 13.2	234 36.6	·· 30.6	255 32.2	·· 11.2	184 42.8	·· 52.8	111 32.6	·· 42.4
	04	259 15.6	249 40.2	29.6	270 32.9	10.4	199 44.7	52.9	126 35.1	42.4
	05	274 18.1	264 43.8	28.6	285 33.5	09.6	214 46.6	53.0	141 37.5	42.4
	06	289 20.6	279 47.4	N11 27.7	300 34.2	S 6 08.9	229 48.6	N19 53.1	156 40.0	N18 42.4
	07	304 23.0	294 51.1	26.7	315 34.9	08.1	244 50.5	53.2	171 42.5	42.4
	08	319 25.5	309 54.7	25.7	330 35.5	07.4	259 52.4	53.3	186 44.9	42.4
MONDAY	09	334 28.0	324 58.3	·· 24.7	345 36.2	·· 06.6	274 54.4	·· 53.4	201 47.4	·· 42.4
	10	349 30.4	340 01.9	23.7	0 36.9	05.9	289 56.3	53.5	216 49.9	42.4
	11	4 32.9	355 05.5	22.7	15 37.5	05.1	304 58.2	53.6	231 52.3	42.4
	12	19 35.4	10 09.1	N11 21.7	30 38.2	S 6 04.3	320 00.2	N19 53.7	246 54.8	N18 42.4
	13	34 37.8	25 12.7	20.8	45 38.8	03.6	335 02.1	53.9	261 57.2	42.4
	14	49 40.3	40 16.3	19.8	60 39.5	02.8	350 04.0	54.0	276 59.7	42.4
	15	64 42.7	55 19.9	·· 18.8	75 40.2	·· 02.1	5 06.0	·· 54.1	292 02.2	·· 42.4
	16	79 45.2	70 23.5	17.8	90 40.8	01.3	20 07.9	54.2	307 04.6	42.4
	17	94 47.7	85 27.1	16.8	105 41.5	6 00.5	35 09.8	54.3	322 07.1	42.4
	18	109 50.1	100 30.7	N11 15.8	120 42.2	S 5 59.8	50 11.7	N19 54.4	337 09.6	N18 42.4
	19	124 52.6	115 34.3	14.8	135 42.8	59.0	65 13.7	54.5	352 12.0	42.4
	20	139 55.1	130 37.9	13.8	150 43.5	58.3	80 15.6	54.6	7 14.5	42.4
	21	154 57.5	145 41.5	·· 12.8	165 44.2	·· 57.5	95 17.5	·· 54.7	22 16.9	·· 42.4
	22	170 00.0	160 45.1	11.9	180 44.8	56.8	110 19.5	54.8	37 19.4	42.4
	23	185 02.5	175 48.6	10.9	195 45.5	56.0	125 21.4	54.9	52 21.9	42.4
12	00	200 04.9	190 52.2	N11 09.9	210 46.1	S 5 55.2	140 23.3	N19 55.1	67 24.3	N18 42.4
	01	215 07.4	205 55.8	08.9	225 46.8	54.5	155 25.3	55.2	82 26.8	42.4
	02	230 09.9	220 59.4	07.9	240 47.5	53.7	170 27.2	55.3	97 29.2	42.4
	03	245 12.3	236 02.9	·· 06.9	255 48.1	·· 53.0	185 29.1	·· 55.4	112 31.7	·· 42.4
	04	260 14.8	251 06.5	05.9	270 48.8	52.2	200 31.0	55.5	127 34.2	42.4
	05	275 17.2	266 10.1	04.9	285 49.5	51.4	215 33.0	55.6	142 36.6	42.4
	06	290 19.7	281 13.6	N11 04.0	300 50.1	S 5 50.7	230 34.9	N19 55.7	157 39.1	N18 42.4
	07	305 22.2	296 17.2	03.0	315 50.8	49.9	245 36.8	55.8	172 41.5	42.4
	08	320 24.6	311 20.7	02.0	330 51.5	49.2	260 38.8	55.9	187 44.0	42.4
TUESDAY	09	335 27.1	326 24.3	·· 01.0	345 52.1	·· 48.4	275 40.7	·· 56.0	202 46.5	·· 42.4
	10	350 29.6	341 27.8	11 00.0	0 52.8	47.7	290 42.6	56.1	217 48.9	42.4
	11	5 32.0	356 31.4	10 59.0	15 53.5	46.9	305 44.5	56.3	232 51.4	42.4
	12	20 34.5	11 34.9	N10 58.0	30 54.1	S 5 46.1	320 46.5	N19 56.4	247 53.8	N18 42.4
	13	35 37.0	26 38.5	57.0	45 54.8	45.4	335 48.4	56.5	262 56.3	42.4
	14	50 39.4	41 42.0	56.1	60 55.4	44.6	350 50.3	56.6	277 58.8	42.4
	15	65 41.9	56 45.5	·· 55.1	75 56.1	·· 43.9	5 52.3	·· 56.7	293 01.2	·· 42.4
	16	80 44.3	71 49.1	54.1	90 56.8	43.1	20 54.2	56.8	308 03.7	42.4
	17	95 46.8	86 52.6	53.1	105 57.4	42.3	35 56.1	56.9	323 06.1	42.4
	18	110 49.3	101 56.1	N10 52.1	120 58.1	S 5 41.6	50 58.0	N19 57.0	338 08.6	N18 42.4
	19	125 51.7	116 59.7	51.1	135 58.8	40.8	66 00.0	57.1	353 11.0	42.4
	20	140 54.2	132 03.2	50.1	150 59.4	40.1	81 01.9	57.2	8 13.5	42.4
	21	155 56.7	147 06.7	·· 49.1	166 00.1	·· 39.3	96 03.8	·· 57.4	23 16.0	·· 42.4
	22	170 59.1	162 10.2	48.2	181 00.8	38.5	111 05.8	57.5	38 18.4	42.4
	23	186 01.6	177 13.7	47.2	196 01.4	37.8	126 07.7	57.6	53 20.9	42.4
Mer. Pass.		h m 10 41.9	v 3.6	d 1.0	v 0.7	d 0.8	v 1.9	d 0.1	v 2.5	d 0.0

STARS		
Name	S.H.A. ° ′	Dec. ° ′
Acamar	315 39.4	S40 23.9
Achernar	335 47.6	S57 21.2
Acrux	173 39.0	S62 58.6
Adhara	255 34.0	S28 56.8
Aldebaran	291 20.9	N16 27.7
Alioth	166 44.1	N56 04.9
Alkaid	153 19.9	N49 25.5
Al Na'ir	28 18.2	S47 04.1
Alnilam	276 14.2	S 1 13.2
Alphard	218 22.7	S 8 33.9
Alphecca	126 33.8	N26 47.3
Alpheratz	358 12.0	N28 57.8
Altair	62 34.8	N 8 48.4
Ankaa	353 43.0	S42 25.8
Antares	112 59.4	S26 22.9
Arcturus	146 20.3	N19 17.9
Atria	108 25.4	S68 59.0
Avior	234 29.0	S59 26.6
Bellatrix	279 01.4	N 6 19.6
Betelgeuse	271 30.9	N 7 24.0
Canopus	264 08.4	S52 41.4
Capella	281 15.0	N45 58.6
Deneb	49 50.1	N45 11.7
Denebola	183 01.1	N14 41.8
Diphda	349 23.5	S18 06.7
Dubhe	194 24.5	N61 52.5
Elnath	278 47.3	N28 35.3
Eltanin	90 58.6	N51 29.3
Enif	34 14.0	N 9 46.2
Fomalhaut	15 54.3	S29 44.5
Gacrux	172 30.7	S56 59.3
Gienah	176 20.0	S17 25.1
Hadar	149 25.9	S60 15.8
Hamal	328 31.9	N23 21.2
Kaus Aust.	84 19.8	S34 23.6
Kochab	137 17.9	N74 14.8
Markab	14 05.7	N15 04.9
Menkar	314 43.8	N 3 59.9
Menkent	148 39.3	S36 15.6
Miaplacidus	221 44.9	S69 37.8
Mirfak	309 19.8	N49 46.8
Nunki	76 32.0	S26 19.4
Peacock	54 02.2	S56 48.2
Pollux	244 01.0	N28 04.8
Procyon	245 28.2	N 5 16.8
Rasalhague	96 31.6	N12 34.5
Regulus	208 12.3	N12 04.6
Rigel	281 38.4	S 8 13.9
Rigil Kent.	140 28.3	S60 44.4
Sabik	102 43.6	S15 41.8
Schedar	350 12.1	N56 24.7
Shaula	96 58.7	S37 05.1
Sirius	258 57.8	S16 41.4
Spica	158 59.7	S11 02.7
Suhail	223 12.3	S43 20.8
Vega	80 57.3	N38 45.6
Zuben'ubi	137 35.3	S15 56.9

	S.H.A. ° ′	Mer. Pass. h m
Venus	350 19.9	11 20
Mars	11 24.5	9 58
Jupiter	300 31.2	14 40
Saturn	227 19.4	19 31

	G.M.T.	SUN G.H.A.	SUN Dec.	MOON G.H.A.	MOON v	MOON Dec.	MOON d	MOON H.P.
	d h	° ′	° ′	° ′	′	° ′	′	′
	10 00	179 38.4	N 7 49.3	278 01.2	6.9	S17 58.8	3.3	58.9
	01	194 38.6	50.2	292 27.1	6.9	17 55.5	3.4	58.9
	02	209 38.8	51.2	306 53.0	7.0	17 52.1	3.6	58.9
	03	224 38.9	·· 52.1	321 19.0	7.0	17 48.5	3.6	58.9
	04	239 39.1	53.0	335 45.0	7.1	17 44.9	3.8	58.8
	05	254 39.3	53.9	350 11.1	7.2	17 41.1	3.8	58.8
	06	269 39.5	N 7 54.9	4 37.3	7.2	S17 37.3	4.0	58.8
	07	284 39.6	55.8	19 03.5	7.3	17 33.3	4.1	58.7
	08	299 39.8	56.7	33 29.8	7.4	17 29.2	4.2	58.7
S	09	314 40.0	·· 57.6	47 56.2	7.4	17 25.0	4.3	58.7
U	10	329 40.1	58.6	62 22.6	7.5	17 20.7	4.3	58.7
N	11	344 40.3	7 59.5	76 49.1	7.5	17 16.4	4.5	58.6
D	12	359 40.5	N 8 00.4	91 15.6	7.6	S17 11.9	4.6	58.6
A	13	14 40.6	01.3	105 42.2	7.7	17 07.3	4.7	58.6
Y	14	29 40.8	02.3	120 08.9	7.8	17 02.6	4.8	58.5
	15	44 41.0	·· 03.2	134 35.7	7.8	16 57.8	4.9	58.5
	16	59 41.1	04.1	149 02.5	7.9	16 52.9	5.0	58.5
	17	74 41.3	05.0	163 29.4	7.9	16 47.9	5.1	58.5
	18	89 41.5	N 8 06.0	177 56.3	8.0	S16 42.8	5.2	58.4
	19	104 41.6	06.9	192 23.3	8.1	16 37.6	5.2	58.4
	20	119 41.8	07.8	206 50.4	8.1	16 32.4	5.4	58.4
	21	134 42.0	·· 08.7	221 17.5	8.3	16 27.0	5.5	58.3
	22	149 42.1	09.6	235 44.8	8.2	16 21.5	5.5	58.3
	23	164 42.3	10.6	250 12.0	8.4	16 16.0	5.7	58.3
	11 00	179 42.5	N 8 11.5	264 39.4	8.4	S16 10.3	5.7	58.3
	01	194 42.6	12.4	279 06.8	8.5	16 04.6	5.9	58.2
	02	209 42.8	13.3	293 34.3	8.6	15 58.7	5.9	58.2
	03	224 43.0	·· 14.2	308 01.9	8.6	15 52.8	6.0	58.2
	04	239 43.1	15.2	322 29.5	8.7	15 46.8	6.1	58.1
	05	254 43.3	16.1	336 57.2	8.7	15 40.7	6.1	58.1
	06	269 43.5	N 8 17.0	351 24.9	8.9	S15 34.6	6.3	58.1
	07	284 43.6	17.9	5 52.8	8.9	15 28.3	6.3	58.1
	08	299 43.8	18.8	20 20.7	8.9	15 22.0	6.5	58.0
M	09	314 44.0	·· 19.8	34 48.6	9.1	15 15.5	6.5	58.0
O	10	329 44.1	20.7	49 16.7	9.1	15 09.0	6.5	58.0
N	11	344 44.3	21.6	63 44.8	9.2	15 02.5	6.7	57.9
D	12	359 44.5	N 8 22.5	78 13.0	9.2	S14 55.8	6.8	57.9
A	13	14 44.6	23.4	92 41.2	9.3	14 49.0	6.8	57.9
Y	14	29 44.8	24.3	107 09.5	9.4	14 42.2	6.9	57.9
	15	44 45.0	·· 25.3	121 37.9	9.4	14 35.3	6.9	57.8
	16	59 45.1	26.2	136 06.3	9.6	14 28.4	7.1	57.8
	17	74 45.3	27.1	150 34.9	9.6	14 21.3	7.1	57.8
	18	89 45.5	N 8 28.0	165 03.5	9.6	S14 14.2	7.2	57.7
	19	104 45.6	28.9	179 32.1	9.7	14 07.0	7.3	57.7
	20	119 45.8	29.8	194 00.8	9.8	13 59.7	7.3	57.7
	21	134 46.0	·· 30.8	208 29.6	9.9	13 52.4	7.4	57.7
	22	149 46.1	31.7	222 58.5	9.9	13 45.0	7.5	57.6
	23	164 46.3	32.6	237 27.4	10.0	13 37.5	7.5	57.6
	12 00	179 46.4	N 8 33.5	251 56.4	10.0	S13 30.0	7.6	57.6
	01	194 46.6	34.4	266 25.4	10.2	13 22.4	7.7	57.5
	02	209 46.8	35.3	280 54.6	10.1	13 14.7	7.8	57.5
	03	224 46.9	·· 36.2	295 23.7	10.3	13 06.9	7.8	57.5
	04	239 47.1	37.2	309 53.0	10.3	12 59.1	7.8	57.5
	05	254 47.3	38.1	324 22.3	10.4	12 51.3	8.0	57.4
	06	269 47.4	N 8 39.0	338 51.7	10.4	S12 43.3	8.0	57.4
	07	284 47.6	39.9	353 21.1	10.6	12 35.3	8.0	57.4
	08	299 47.7	40.8	7 50.7	10.5	12 27.3	8.1	57.4
T	09	314 47.9	·· 41.7	22 20.2	10.7	12 19.2	8.2	57.3
U	10	329 48.1	42.6	36 49.9	10.7	12 11.0	8.2	57.3
E	11	344 48.2	43.5	51 19.6	10.7	12 02.8	8.3	57.3
S	12	359 48.4	N 8 44.5	65 49.3	10.9	S11 54.5	8.3	57.2
D	13	14 48.6	45.4	80 19.2	10.9	11 46.2	8.4	57.2
A	14	29 48.7	46.3	94 49.1	10.9	11 37.8	8.5	57.2
Y	15	44 48.9	·· 47.2	109 19.0	11.0	11 29.3	8.5	57.2
	16	59 49.0	48.1	123 49.0	11.1	11 20.8	8.5	57.1
	17	74 49.2	49.0	138 19.1	11.1	11 12.3	8.6	57.1
	18	89 49.4	N 8 49.9	152 49.2	11.2	S11 03.7	8.6	57.1
	19	104 49.5	50.8	167 19.4	11.3	10 55.1	8.7	57.1
	20	119 49.7	51.7	181 49.7	11.3	10 46.4	8.8	57.0
	21	134 49.8	·· 52.7	196 20.0	11.3	10 37.6	8.8	57.0
	22	149 50.0	53.6	210 50.3	11.5	10 28.8	8.8	57.0
	23	164 50.2	54.5	225 20.8	11.4	10 20.0	8.9	57.0
		S.D. 16.0	d 0.9	S.D. 16.0		15.8		15.6

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 10	Moonrise 11	Moonrise 12	Moonrise 13
°	h m	h m	h m	h m	h m	h m	h m
N 72	////	02 34	04 03	05 07	04 35	04 24	04 15
N 70	////	03 01	04 16	03 47	03 56	04 00	04 01
68	01 35	03 22	04 27	03 08	03 29	03 41	03 49
66	02 12	03 38	04 36	02 41	03 09	03 26	03 39
64	02 38	03 51	04 44	02 20	02 52	03 14	03 30
62	02 57	04 02	04 50	02 04	02 38	03 04	03 23
60	03 13	04 11	04 56	01 49	02 27	02 55	03 17
N 58	03 25	04 19	05 01	01 37	02 16	02 47	03 11
56	03 36	04 26	05 05	01 27	02 08	02 40	03 06
54	03 46	04 32	05 09	01 18	02 00	02 34	03 02
52	03 54	04 37	05 13	01 09	01 53	02 28	02 58
50	04 01	04 42	05 16	01 02	01 46	02 23	02 54
45	04 16	04 53	05 23	00 46	01 32	02 12	02 46
N 40	04 28	05 01	05 29	00 33	01 21	02 03	02 40
35	04 37	05 08	05 34	00 22	01 11	01 55	02 34
30	04 45	05 14	05 38	00 12	01 03	01 48	02 29
20	04 57	05 23	05 45	24 48	00 48	01 36	02 20
N 10	05 06	05 31	05 52	24 35	00 35	01 25	02 12
0	05 13	05 37	05 58	24 23	00 23	01 15	02 05
S 10	05 18	05 42	06 04	24 11	00 11	01 05	01 58
20	05 22	05 47	06 10	23 58	24 55	00 55	01 50
30	05 25	05 52	06 16	23 43	24 43	00 43	01 41
35	05 26	05 55	06 20	23 34	24 36	00 36	01 36
40	05 26	05 58	06 25	23 24	24 28	00 28	01 30
45	05 26	06 00	06 30	23 13	24 18	00 18	01 24
S 50	05 26	06 03	06 36	22 59	24 07	00 07	01 15
52	05 25	06 04	06 39	22 52	24 02	00 02	01 12
54	05 25	06 06	06 42	22 45	23 56	25 07	01 07
56	05 24	06 07	06 45	22 37	23 49	25 03	01 03
58	05 23	06 09	06 49	22 28	23 42	24 58	00 58
S 60	05 22	06 11	06 53	22 17	23 34	24 52	00 52

Lat.	Sunset	Twilight Civil	Twilight Naut.	Moonset 10	Moonset 11	Moonset 12	Moonset 13
°	h m	h m	h m	h m	h m	h m	h m
N 72	20 03	21 35	////	06 22	08 48	10 47	12 37
N 70	19 49	21 05	////	07 41	09 26	11 10	12 50
68	19 37	20 44	22 36	08 20	09 52	11 27	13 01
66	19 28	20 27	21 55	08 46	10 12	11 41	13 10
64	19 20	20 14	21 28	09 07	10 28	11 53	13 17
62	19 14	20 03	21 08	09 23	10 41	12 02	13 23
60	19 08	19 53	20 52	09 37	10 52	12 10	13 28
N 58	19 03	19 45	20 39	09 49	11 02	12 18	13 33
56	18 58	19 38	20 28	09 59	11 11	12 24	13 37
54	18 54	19 32	20 18	10 08	11 18	12 30	13 41
52	18 51	19 26	20 10	10 16	11 25	12 35	13 45
50	18 47	19 21	20 02	10 23	11 31	12 39	13 48
45	18 40	19 10	19 47	10 38	11 44	12 49	13 54
N 40	18 34	19 02	19 35	10 51	11 54	12 58	14 00
35	18 29	18 55	19 26	11 02	12 04	13 05	14 05
30	18 25	18 49	19 18	11 11	12 12	13 11	14 09
20	18 17	18 39	19 06	11 27	12 25	13 22	14 16
N 10	18 10	18 32	18 56	11 41	12 37	13 31	14 22
0	18 04	18 25	18 50	11 54	12 48	13 40	14 28
S 10	17 58	18 20	18 44	12 07	12 59	13 48	14 34
20	17 52	18 14	18 40	12 21	13 11	13 57	14 40
30	17 45	18 09	18 37	12 37	13 24	14 08	14 47
35	17 41	18 07	18 36	12 46	13 32	14 14	14 51
40	17 37	18 04	18 35	12 56	13 41	14 20	14 56
45	17 32	18 01	18 35	13 08	13 51	14 28	15 01
S 50	17 25	17 58	18 35	13 23	14 03	14 37	15 07
52	17 23	17 57	18 36	13 30	14 09	14 42	15 10
54	17 20	17 55	18 36	13 37	14 15	14 47	15 13
56	17 16	17 54	18 37	13 46	14 22	14 52	15 16
58	17 12	17 52	18 37	13 56	14 30	14 58	15 20
S 60	17 08	17 50	18 38	14 06	14 39	15 04	15 25

Day	SUN Eqn. of Time 00ʰ	SUN Eqn. of Time 12ʰ	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
	m s	m s	h m	h m	h m	d	
10	01 27	01 18	12 01	05 41	18 09	22	
11	01 10	01 02	12 01	06 36	19 02	23	◑
12	00 55	00 47	12 01	07 28	19 52	24	

	G.M.T.	ARIES	VENUS −3.5		MARS +1.4		JUPITER −1.6		SATURN +0.4	
		G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
	d h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
	13 00	201 04.1	192 17.2	N10 46.2	211 02.1	S 5 37.0	141 09.6	N19 57.7	68 23.3	N18 42.4
	01	216 06.5	207 20.7	45.2	226 02.8	36.3	156 11.5	57.8	83 25.8	42.4
	02	231 09.0	222 24.2	44.2	241 03.4	35.5	171 13.5	57.9	98 28.2	42.4
	03	246 11.5	237 27.7	·· 43.2	256 04.1	·· 34.7	186 15.4	·· 58.0	113 30.7	·· 42.4
	04	261 13.9	252 31.2	42.3	271 04.8	34.0	201 17.3	58.1	128 33.1	42.4
	05	276 16.4	267 34.7	41.3	286 05.4	33.2	216 19.2	58.2	143 35.6	42.4
	06	291 18.8	282 38.2	N10 40.3	301 06.1	S 5 32.4	231 21.2	N19 58.3	158 38.1	N18 42.4
W	07	306 21.3	297 41.7	39.3	316 06.8	31.7	246 23.1	58.4	173 40.5	42.3
E	08	321 23.8	312 45.2	38.3	331 07.4	30.9	261 25.0	58.6	188 43.0	42.3
D	09	336 26.2	327 48.7	·· 37.3	346 08.1	·· 30.2	276 26.9	·· 58.7	203 45.4	·· 42.3
N	10	351 28.7	342 52.1	36.4	1 08.8	29.4	291 28.9	58.8	218 47.9	42.3
E	11	6 31.2	357 55.6	35.4	16 09.4	28.6	306 30.8	58.9	233 50.3	42.3
S	12	21 33.6	12 59.1	N10 34.4	31 10.1	S 5 27.9	321 32.7	N19 59.0	248 52.8	N18 42.3
D	13	36 36.1	28 02.6	33.4	46 10.8	27.1	336 34.6	59.1	263 55.2	42.3
A	14	51 38.6	43 06.0	32.4	61 11.4	26.4	351 36.6	59.2	278 57.7	42.3
Y	15	66 41.0	58 09.5	·· 31.5	76 12.1	·· 25.6	6 38.5	·· 59.3	294 00.1	·· 42.3
	16	81 43.5	73 13.0	30.5	91 12.8	24.8	21 40.4	59.4	309 02.6	42.3
	17	96 46.0	88 16.4	29.5	106 13.4	24.1	36 42.3	59.5	324 05.1	42.3
	18	111 48.4	103 19.9	N10 28.5	121 14.1	S 5 23.3	51 44.3	N19 59.6	339 07.5	N18 42.3
	19	126 50.9	118 23.3	27.5	136 14.8	22.6	66 46.2	59.8	354 10.0	42.3
	20	141 53.3	133 26.8	26.6	151 15.5	21.8	81 48.1	19 59.9	9 12.4	42.3
	21	156 55.8	148 30.2	·· 25.6	166 16.1	·· 21.0	96 50.0	20 00.0	24 14.9	·· 42.3
	22	171 58.3	163 33.7	24.6	181 16.8	20.3	111 52.0	00.1	39 17.3	42.3
	23	187 00.7	178 37.1	23.6	196 17.5	19.5	126 53.9	00.2	54 19.8	42.3
	14 00	202 03.2	193 40.5	N10 22.6	211 18.1	S 5 18.7	141 55.8	N20 00.3	69 22.2	N18 42.3
	01	217 05.7	208 44.0	21.7	226 18.8	18.0	156 57.7	00.4	84 24.7	42.3
	02	232 08.1	223 47.4	20.7	241 19.5	17.2	171 59.7	00.5	99 27.1	42.3
	03	247 10.6	238 50.8	·· 19.7	256 20.1	·· 16.5	187 01.6	·· 00.6	114 29.6	·· 42.3
	04	262 13.1	253 54.2	18.7	271 20.8	15.7	202 03.5	00.7	129 32.0	42.3
	05	277 15.5	268 57.7	17.8	286 21.5	14.9	217 05.4	00.8	144 34.5	42.3
	06	292 18.0	284 01.1	N10 16.8	301 22.1	S 5 14.2	232 07.3	N20 01.0	159 36.9	N18 42.3
	07	307 20.4	299 04.5	15.8	316 22.8	13.4	247 09.3	01.1	174 39.4	42.3
T	08	322 22.9	314 07.9	14.9	331 23.5	12.6	262 11.2	01.2	189 41.8	42.3
H	09	337 25.4	329 11.3	·· 13.9	346 24.1	·· 11.9	277 13.1	·· 01.3	204 44.3	·· 42.2
U	10	352 27.8	344 14.7	12.9	1 24.8	11.1	292 15.0	01.4	219 46.7	42.2
R	11	7 30.3	359 18.1	11.9	16 25.5	10.4	307 17.0	01.5	234 49.2	42.2
S	12	22 32.8	14 21.5	N10 11.0	31 26.2	S 5 09.6	322 18.9	N20 01.6	249 51.6	N18 42.2
D	13	37 35.2	29 24.9	10.0	46 26.8	08.8	337 20.8	01.7	264 54.1	42.2
A	14	52 37.7	44 28.3	09.0	61 27.5	08.1	352 22.7	01.8	279 56.5	42.2
Y	15	67 40.2	59 31.7	·· 08.1	76 28.2	·· 07.3	7 24.6	·· 01.9	294 59.0	·· 42.2
	16	82 42.6	74 35.1	07.1	91 28.8	06.5	22 26.6	02.0	310 01.4	42.2
	17	97 45.1	89 38.4	06.1	106 29.5	05.8	37 28.5	02.2	325 03.9	42.2
	18	112 47.6	104 41.8	N10 05.2	121 30.2	S 5 05.0	52 30.4	N20 02.3	340 06.3	N18 42.2
	19	127 50.0	119 45.2	04.2	136 30.8	04.3	67 32.3	02.4	355 08.8	42.2
	20	142 52.5	134 48.6	03.2	151 31.5	03.5	82 34.3	02.5	10 11.2	42.2
	21	157 54.9	149 51.9	·· 02.3	166 32.2	·· 02.7	97 36.2	·· 02.6	25 13.7	·· 42.2
	22	172 57.4	164 55.3	01.3	181 32.9	02.0	112 38.1	02.7	40 16.1	42.2
	23	187 59.9	179 58.6	10 00.3	196 33.5	01.2	127 40.0	02.8	55 18.5	42.2
	15 00	203 02.3	195 02.0	N 9 59.4	211 34.2	S 5 00.4	142 41.9	N20 02.9	70 21.0	N18 42.2
	01	218 04.8	210 05.4	58.4	226 34.9	4 59.7	157 43.9	03.0	85 23.4	42.2
	02	233 07.3	225 08.7	57.5	241 35.5	58.9	172 45.8	03.1	100 25.9	42.2
	03	248 09.7	240 12.1	·· 56.5	256 36.2	·· 58.1	187 47.7	·· 03.2	115 28.3	·· 42.2
	04	263 12.2	255 15.4	55.5	271 36.9	57.4	202 49.6	03.3	130 30.8	42.2
	05	278 14.7	270 18.7	54.6	286 37.6	56.6	217 51.5	03.5	145 33.2	42.1
	06	293 17.1	285 22.1	N 9 53.6	301 38.2	S 4 55.9	232 53.5	N20 03.6	160 35.7	N18 42.1
	07	308 19.6	300 25.4	52.7	316 38.9	55.1	247 55.4	03.7	175 38.1	42.1
	08	323 22.1	315 28.7	51.7	331 39.6	54.3	262 57.3	03.8	190 40.6	42.1
F	09	338 24.5	330 32.1	·· 50.7	346 40.2	·· 53.6	277 59.2	·· 03.9	205 43.0	·· 42.1
R	10	353 27.0	345 35.4	49.8	1 40.9	52.8	293 01.1	04.0	220 45.5	42.1
I	11	8 29.4	0 38.7	48.8	16 41.6	52.0	308 03.1	04.1	235 47.9	42.1
D	12	23 31.9	15 42.0	N 9 47.9	31 42.3	S 4 51.3	323 05.0	N20 04.2	250 50.3	N18 42.1
A	13	38 34.4	30 45.3	46.9	46 42.9	50.5	338 06.9	04.3	265 52.8	42.1
Y	14	53 36.8	45 48.6	46.0	61 43.6	49.7	353 08.8	04.4	280 55.2	42.1
	15	68 39.3	60 51.9	·· 45.0	76 44.3	·· 49.0	8 10.7	·· 04.5	295 57.7	·· 42.1
	16	83 41.8	75 55.3	44.1	91 45.0	48.2	23 12.6	04.7	311 00.1	42.1
	17	98 44.2	90 58.6	43.1	106 45.6	47.4	38 14.6	04.8	326 02.6	42.1
	18	113 46.7	106 01.8	N 9 42.2	121 46.3	S 4 46.7	53 16.5	N20 04.9	341 05.0	N18 42.1
	19	128 49.2	121 05.1	41.2	136 47.0	45.9	68 18.4	05.0	356 07.5	42.1
	20	143 51.6	136 08.4	40.3	151 47.6	45.2	83 20.3	05.1	11 09.9	42.1
	21	158 54.1	151 11.7	·· 39.3	166 48.3	·· 44.4	98 22.2	·· 05.2	26 12.3	·· 42.0
	22	173 56.5	166 15.0	38.4	181 49.0	43.6	113 24.2	05.3	41 14.8	42.0
	23	188 59.0	181 18.3	37.4	196 49.7	42.9	128 26.1	05.4	56 17.2	42.0
		h m								
	Mer. Pass.	10 30.1	*v* 3.4	*d* 1.0	*v* 0.7	*d* 0.8	*v* 1.9	*d* 0.1	*v* 2.4	*d* 0.0

STARS		
Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 39.4	S40 23.9
Achernar	335 47.6	S57 21.2
Acrux	173 39.1	S62 58.6
Adhara	255 34.0	S28 56.8
Aldebaran	291 20.9	N16 27.7
Alioth	166 44.1	N56 05.0
Alkaid	153 19.9	N49 25.5
Al Na'ir	28 18.2	S47 04.1
Alnilam	276 14.2	S 1 13.2
Alphard	218 22.7	S 8 33.9
Alphecca	126 33.8	N26 47.3
Alpheratz	358 12.0	N28 57.8
Altair	62 34.8	N 8 48.4
Ankaa	353 43.0	S42 25.7
Antares	112 59.4	S26 22.9
Arcturus	146 20.3	N19 17.9
Atria	108 25.4	S68 59.0
Avior	234 29.0	S59 26.6
Bellatrix	279 01.4	N 6 19.6
Betelgeuse	271 30.9	N 7 24.0
Canopus	264 08.4	S52 41.4
Capella	281 15.0	N45 58.6
Deneb	49 50.1	N45 11.7
Denebola	183 01.1	N14 41.8
Diphda	349 23.5	S18 06.7
Dubhe	194 24.5	N61 52.5
Elnath	278 47.3	N28 35.3
Eltanin	90 58.6	N51 29.3
Enif	34 14.0	N 9 46.2
Fomalhaut	15 54.3	S29 44.5
Gacrux	172 30.7	S56 59.3
Gienah	176 20.0	S17 25.1
Hadar	149 25.9	S60 15.9
Hamal	328 31.9	N23 21.2
Kaus Aust.	84 19.8	S34 23.6
Kochab	137 17.9	N74 14.8
Markab	14 05.7	N15 04.9
Menkar	314 43.9	N 3 59.9
Menkent	148 39.3	S36 15.6
Miaplacidus	221 45.0	S69 37.8
Mirfak	309 19.8	N49 46.8
Nunki	76 32.0	S26 19.4
Peacock	54 02.2	S56 48.2
Pollux	244 01.0	N28 04.8
Procyon	245 28.2	N 5 16.8
Rasalhague	96 31.6	N12 34.5
Regulus	208 12.3	N12 04.6
Rigel	281 38.4	S 8 13.9
Rigil Kent.	140 28.3	S60 44.4
Sabik	102 43.6	S15 41.8
Schedar	350 12.1	N56 24.7
Shaula	96 58.7	S37 05.1
Sirius	258 57.8	S16 41.4
Spica	158 59.7	S11 02.7
Suhail	223 12.3	S43 20.8
Vega	80 57.3	N38 45.6
Zuben'ubi	137 35.3	S15 56.9

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	351 37.3	11 03
Mars	9 14.9	9 54
Jupiter	299 52.6	14 30
Saturn	227 19.0	19 19

G.M.T.		SUN		MOON				
		G.H.A.	Dec.	G.H.A.	v	Dec.	d	H.P.
d	h	° ′	° ′	° ′	′	° ′	′	′
13	00	179 50.3	N 8 55.4	239 51.2	11.6	S10 11.1	8.9	56.9
	01	194 50.5	56.3	254 21.8	11.6	10 02.2	9.0	56.9
	02	209 50.6	57.2	268 52.4	11.6	9 53.2	9.0	56.9
	03	224 50.8	·· 58.1	283 23.0	11.7	9 44.2	9.1	56.8
	04	239 51.0	59.0	297 53.7	11.8	9 35.1	9.1	56.8
	05	254 51.1	8 59.9	312 24.5	11.8	9 26.0	9.1	56.8
	06	269 51.3	N 9 00.8	326 55.3	11.9	S 9 16.9	9.2	56.8
W	07	284 51.4	01.7	341 26.2	11.9	9 07.7	9.2	56.7
E	08	299 51.6	02.6	355 57.1	12.0	8 58.5	9.2	56.7
D	09	314 51.8	·· 03.5	10 28.1	12.0	8 49.3	9.3	56.7
N	10	329 51.9	04.5	24 59.1	12.1	8 40.0	9.3	56.7
E	11	344 52.1	05.4	39 30.2	12.1	8 30.7	9.4	56.6
S	12	359 52.2	N 9 06.3	54 01.3	12.2	S 8 21.3	9.4	56.6
D	13	14 52.4	07.2	68 32.5	12.2	8 11.9	9.4	56.6
A	14	29 52.6	08.1	83 03.7	12.3	8 02.5	9.5	56.6
Y	15	44 52.7	·· 09.0	97 35.0	12.3	7 53.0	9.4	56.6
	16	59 52.9	09.9	112 06.3	12.4	7 43.6	9.5	56.5
	17	74 53.0	10.8	126 37.7	12.4	7 34.1	9.6	56.5
	18	89 53.2	N 9 11.7	141 09.1	12.4	S 7 24.5	9.6	56.5
	19	104 53.3	12.6	155 40.5	12.6	7 14.9	9.6	56.5
	20	119 53.5	13.5	170 12.1	12.5	7 05.3	9.6	56.4
	21	134 53.7	·· 14.4	184 43.6	12.6	6 55.7	9.6	56.4
	22	149 53.8	15.3	199 15.2	12.6	6 46.1	9.7	56.4
	23	164 54.0	16.2	213 46.8	12.7	6 36.4	9.7	56.4
14	00	179 54.1	N 9 17.1	228 18.5	12.8	S 6 26.7	9.7	56.3
	01	194 54.3	18.0	242 50.3	12.7	6 17.0	9.8	56.3
	02	209 54.4	18.9	257 22.0	12.8	6 07.2	9.8	56.3
	03	224 54.6	·· 19.8	271 53.8	12.9	5 57.4	9.7	56.3
	04	239 54.8	20.7	286 25.7	12.9	5 47.7	9.9	56.2
	05	254 54.9	21.6	300 57.6	12.9	5 37.8	9.8	56.2
	06	269 55.1	N 9 22.5	315 29.5	13.0	S 5 28.0	9.8	56.2
	07	284 55.2	23.4	330 01.5	13.0	5 18.2	9.9	56.2
T	08	299 55.4	24.3	344 33.5	13.0	5 08.3	9.9	56.2
H	09	314 55.5	·· 25.2	359 05.5	13.1	4 58.4	9.9	56.1
U	10	329 55.7	26.1	13 37.6	13.2	4 48.5	9.9	56.1
R	11	344 55.8	27.0	28 09.8	13.1	4 38.6	9.9	56.1
S	12	359 56.0	N 9 27.9	42 41.9	13.2	S 4 28.7	10.0	56.1
D	13	14 56.2	28.8	57 14.1	13.2	4 18.7	9.9	56.0
A	14	29 56.3	29.7	71 46.3	13.3	4 08.8	10.0	56.0
Y	15	44 56.5	·· 30.6	86 18.6	13.3	3 58.8	10.0	56.0
	16	59 56.6	31.5	100 50.9	13.3	3 48.8	10.0	56.0
	17	74 56.8	32.4	115 23.2	13.4	3 38.8	10.0	56.0
	18	89 56.9	N 9 33.3	129 55.6	13.3	S 3 28.8	10.0	55.9
	19	104 57.1	34.2	144 27.9	13.5	3 18.8	10.0	55.9
	20	119 57.2	35.1	159 00.4	13.4	3 08.8	10.0	55.9
	21	134 57.4	·· 36.0	173 32.8	13.5	2 58.8	10.0	55.9
	22	149 57.5	36.9	188 05.3	13.5	2 48.8	10.1	55.8
	23	164 57.7	37.8	202 37.8	13.5	2 38.7	10.0	55.8
15	00	179 57.8	N 9 38.7	217 10.3	13.6	S 2 28.7	10.1	55.8
	01	194 58.0	39.6	231 42.9	13.6	2 18.6	10.0	55.8
	02	209 58.1	40.5	246 15.5	13.6	2 08.6	10.1	55.8
	03	224 58.3	·· 41.4	260 48.1	13.6	1 58.5	10.0	55.7
	04	239 58.5	42.3	275 20.7	13.7	1 48.5	10.1	55.7
	05	254 58.6	43.2	289 53.4	13.7	1 38.4	10.0	55.7
	06	269 58.8	N 9 44.1	304 26.1	13.7	S 1 28.4	10.1	55.7
	07	284 58.9	45.0	318 58.8	13.7	1 18.3	10.1	55.7
	08	299 59.1	45.8	333 31.5	13.8	1 08.2	10.0	55.6
F	09	314 59.2	·· 46.7	348 04.3	13.8	0 58.2	10.1	55.6
R	10	329 59.4	47.6	2 37.1	13.8	0 48.1	10.0	55.6
I	11	344 59.5	48.5	17 09.9	13.8	0 38.1	10.1	55.6
D	12	359 59.7	N 9 49.4	31 42.7	13.8	S 0 28.0	10.0	55.6
A	13	14 59.8	50.3	46 15.5	13.9	0 18.0	10.1	55.5
Y	14	30 00.0	51.2	60 48.4	13.9	S 0 07.9	10.0	55.5
	15	45 00.1	·· 52.1	75 21.3	13.9	N 0 02.1	10.0	55.5
	16	60 00.3	53.0	89 54.2	13.9	0 12.1	10.0	55.5
	17	75 00.4	53.9	104 27.1	13.9	0 22.1	10.1	55.5
	18	90 00.6	N 9 54.8	119 00.0	14.0	N 0 32.2	10.0	55.5
	19	105 00.7	55.7	133 33.0	13.9	0 42.2	10.0	55.4
	20	120 00.9	56.5	148 05.9	14.0	0 52.2	9.9	55.4
	21	135 01.0	·· 57.4	162 38.9	14.0	1 02.1	10.0	55.4
	22	150 01.2	58.3	177 11.9	14.0	1 12.1	10.0	55.4
	23	165 01.3	59.2	191 44.9	14.0	1 22.1	9.9	55.4
		S.D. 16.0	d 0.9	S.D. 15.4		15.3		15.1

Lat.	Twilight		Sunrise	Moonrise			
	Naut.	Civil		13	14	15	16
°	h m	h m	h m	h m	h m	h m	h m
N 72	////	02 09	03 46	04 15	04 09	04 02	03 56
N 70	////	02 42	04 02	04 01	04 00	04 00	03 59
68	00 59	03 06	04 14	03 49	03 54	03 58	04 01
66	01 51	03 24	04 25	03 39	03 48	03 56	04 03
64	02 21	03 39	04 33	03 30	03 43	03 54	04 05
62	02 43	03 51	04 41	03 23	03 39	03 53	04 06
60	03 01	04 01	04 47	03 17	03 35	03 52	04 08
N 58	03 15	04 10	04 53	03 11	03 32	03 51	04 09
56	03 27	04 18	04 58	03 06	03 29	03 50	04 10
54	03 37	04 24	05 02	03 02	03 27	03 49	04 11
52	03 46	04 30	05 06	02 58	03 24	03 48	04 12
50	03 54	04 36	05 10	02 54	03 22	03 48	04 12
45	04 10	04 47	05 18	02 46	03 17	03 46	04 14
N 40	04 23	04 56	05 24	02 40	03 13	03 45	04 15
35	04 33	05 04	05 30	02 34	03 10	03 44	04 17
30	04 41	05 10	05 35	02 29	03 07	03 43	04 18
20	04 54	05 21	05 43	02 20	03 02	03 41	04 20
N 10	05 04	05 29	05 50	02 12	02 57	03 40	04 21
0	05 12	05 36	05 57	02 05	02 53	03 38	04 23
S 10	05 18	05 42	06 04	01 58	02 48	03 37	04 25
20	05 23	05 48	06 11	01 50	02 44	03 36	04 27
30	05 26	05 54	06 18	01 41	02 38	03 34	04 29
35	05 28	05 57	06 23	01 36	02 35	03 33	04 30
40	05 29	06 00	06 28	01 30	02 32	03 32	04 31
45	05 30	06 04	06 34	01 24	02 28	03 31	04 33
S 50	05 30	06 08	06 40	01 15	02 23	03 29	04 35
52	05 30	06 09	06 44	01 12	02 21	03 29	04 35
54	05 30	06 11	06 47	01 07	02 18	03 28	04 36
56	05 30	06 13	06 51	01 03	02 16	03 27	04 38
58	05 30	06 15	06 55	00 58	02 13	03 26	04 39
S 60	05 29	06 17	07 00	00 52	02 09	03 25	04 40

Lat.	Sunset	Twilight		Moonset			
		Civil	Naut.	13	14	15	16
°	h m	h m	h m	h m	h m	h m	h m
N 72	20 19	21 59	////	12 37	14 21	16 02	17 40
N 70	20 02	21 23	////	12 50	14 27	16 01	17 34
68	19 49	20 58	23 18	13 01	14 32	16 01	17 29
66	19 38	20 39	22 16	13 10	14 36	16 01	17 25
64	19 29	20 24	21 44	13 17	14 40	16 01	17 21
62	19 22	20 12	21 21	13 23	14 43	16 01	17 18
60	19 15	20 01	21 03	13 28	14 45	16 01	17 15
N 58	19 09	19 52	20 48	13 33	14 48	16 01	17 13
56	19 04	19 45	20 36	13 37	14 50	16 01	17 11
54	19 00	19 38	20 25	13 41	14 52	16 01	17 09
52	18 56	19 32	20 16	13 45	14 53	16 01	17 07
50	18 52	19 26	20 08	13 48	14 55	16 01	17 06
45	18 44	19 15	19 52	13 54	14 58	16 01	17 02
N 40	18 37	19 05	19 39	14 00	15 01	16 01	16 59
35	18 31	18 58	19 28	14 05	15 03	16 00	16 57
30	18 26	18 51	19 20	14 09	15 05	16 00	16 55
20	18 18	18 40	19 07	14 16	15 09	16 00	16 51
N 10	18 10	18 32	18 57	14 22	15 12	16 00	16 48
0	18 04	18 25	18 49	14 28	15 15	16 00	16 44
S 10	17 57	18 18	18 43	14 34	15 18	16 00	16 41
20	17 50	18 12	18 38	14 40	15 21	16 00	16 38
30	17 42	18 06	18 34	14 47	15 24	15 59	16 34
35	17 37	18 03	18 32	14 51	15 26	15 59	16 32
40	17 32	18 00	18 31	14 56	15 28	15 59	16 30
45	17 26	17 56	18 30	15 01	15 31	15 59	16 27
S 50	17 19	17 52	18 29	15 07	15 34	15 59	16 23
52	17 16	17 50	18 29	15 10	15 35	15 59	16 22
54	17 13	17 48	18 29	15 13	15 37	15 59	16 20
56	17 09	17 46	18 29	15 16	15 38	15 58	16 18
58	17 04	17 44	18 30	15 20	15 40	15 58	16 16
S 60	17 00	17 42	18 30	15 25	15 42	15 58	16 14

Day	SUN			MOON			
	Eqn. of Time		Mer. Pass.	Mer. Pass.		Age	Phase
	00ʰ	12ʰ		Upper	Lower		
	m s	m s	h m	h m	h m	d	
13	00 39	00 31	12 01	08 17	20 40	25	◐
14	00 24	00 16	12 00	09 04	21 27	26	
15	00 09	00 02	12 00	09 49	22 12	27	

1977 APRIL 16, 17, 18 (SAT., SUN., MON.)

G.M.T.	ARIES	VENUS −3.7		MARS +1.3		JUPITER −1.6		SATURN +0.4		STARS		
	G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	Name	S.H.A.	Dec.
d h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	° ′
16 00	204 01.5	196 21.5	N 9 36.5	211 50.3	S 4 42.1	143 28.0	N20 05.5	71 19.7	N18 42.0	Acamar	315 39.4	S40 23.9
01	219 03.9	211 24.8	35.5	226 51.0	41.3	158 29.9	05.6	86 22.1	42.0	Achernar	335 47.6	S57 21.2
02	234 06.4	226 28.1	34.6	241 51.7	40.6	173 31.8	05.7	101 24.5	42.0	Acrux	173 39.1	S62 58.6
03	249 08.9	241 31.3	· · 33.7	256 52.4	· · 39.8	188 33.7	· · 05.8	116 27.0	· · 42.0	Adhara	255 34.0	S28 56.8
04	264 11.3	256 34.6	32.7	271 53.0	39.0	203 35.7	06.0	131 29.4	42.0	Aldebaran	291 20.9	N16 27.7
05	279 13.8	271 37.9	31.8	286 53.7	38.3	218 37.6	06.1	146 31.9	42.0			
06	294 16.3	286 41.1	N 9 30.8	301 54.4	S 4 37.5	233 39.5	N20 06.2	161 34.3	N18 42.0	Alioth	166 44.1	N56 05.0
07	309 18.7	301 44.4	29.9	316 55.1	36.7	248 41.4	06.3	176 36.8	42.0	Alkaid	153 19.9	N49 25.5
S 08	324 21.2	316 47.6	29.0	331 55.7	36.0	263 43.3	06.4	191 39.2	42.0	Al Na'ir	28 18.1	S47 04.1
A 09	339 23.7	331 50.9	· · 28.0	346 56.4	· · 35.2	278 45.2	· · 06.5	206 41.6	· · 42.0	Alnilam	276 14.2	S 1 13.2
T 10	354 26.1	346 54.1	27.1	1 57.1	34.4	293 47.2	06.6	221 44.1	42.0	Alphard	218 22.7	S 8 33.9
U 11	9 28.6	1 57.3	26.2	16 57.7	33.7	308 49.1	06.7	236 46.5	42.0			
R 12	24 31.0	17 00.6	N 9 25.2	31 58.4	S 4 32.9	323 51.0	N20 06.8	251 49.0	N18 41.9	Alphecca	126 33.8	N26 47.3
D 13	39 33.5	32 03.8	24.3	46 59.1	32.1	338 52.9	06.9	266 51.4	41.9	Alpheratz	358 12.0	N28 57.8
A 14	54 36.0	47 07.0	23.4	61 59.8	31.4	353 54.8	07.0	281 53.8	41.9	Altair	62 34.8	N 8 48.4
Y 15	69 38.4	62 10.2	· · 22.4	77 00.4	· · 30.6	8 56.7	· · 07.1	296 56.3	· · 41.9	Ankaa	353 43.0	S42 25.7
16	84 40.9	77 13.5	21.5	92 01.1	29.8	23 58.7	07.3	311 58.7	41.9	Antares	112 59.4	S26 22.9
17	99 43.4	92 16.7	20.6	107 01.8	29.1	39 00.6	07.4	327 01.2	41.9			
18	114 45.8	107 19.9	N 9 19.6	122 02.5	S 4 28.3	54 02.5	N20 07.5	342 03.6	N18 41.9	Arcturus	146 20.3	N19 17.9
19	129 48.3	122 23.1	18.7	137 03.1	27.5	69 04.4	07.6	357 06.0	41.9	Atria	108 25.3	S68 59.0
20	144 50.8	137 26.3	17.8	152 03.8	26.8	84 06.3	07.7	12 08.5	41.9	Avior	234 29.0	S59 26.6
21	159 53.2	152 29.5	· · 16.9	167 04.5	· · 26.0	99 08.2	· · 07.8	27 10.9	· · 41.9	Bellatrix	279 01.4	N 6 19.6
22	174 55.7	167 32.7	15.9	182 05.2	25.2	114 10.1	07.9	42 13.3	41.9	Betelgeuse	271 30.9	N 7 24.0
23	189 58.2	182 35.9	15.0	197 05.8	24.5	129 12.1	08.0	57 15.8	41.9			
17 00	205 00.6	197 39.1	N 9 14.1	212 06.5	S 4 23.7	144 14.0	N20 08.1	72 18.2	N18 41.9	Canopus	264 08.4	S52 41.4
01	220 03.1	212 42.3	13.2	227 07.2	23.0	159 15.9	08.2	87 20.7	41.8	Capella	281 15.0	N45 58.6
02	235 05.5	227 45.4	12.3	242 07.9	22.2	174 17.8	08.3	102 23.1	41.8	Deneb	49 50.1	N45 11.7
03	250 08.0	242 48.6	· · 11.3	257 08.5	· · 21.4	189 19.7	· · 08.4	117 25.5	· · 41.8	Denebola	183 01.1	N14 41.8
04	265 10.5	257 51.8	10.4	272 09.2	20.7	204 21.6	08.6	132 28.0	41.8	Diphda	349 23.5	S18 06.7
05	280 12.9	272 55.0	09.5	287 09.9	19.9	219 23.5	08.7	147 30.4	41.8			
06	295 15.4	287 58.1	N 9 08.6	302 10.6	S 4 19.1	234 25.5	N20 08.8	162 32.8	N18 41.8	Dubhe	194 24.6	N61 52.5
07	310 17.9	303 01.3	07.7	317 11.3	18.4	249 27.4	08.9	177 35.3	41.8	Elnath	278 47.3	N28 35.3
08	325 20.3	318 04.4	06.8	332 11.9	17.6	264 29.3	09.0	192 37.7	41.8	Eltanin	90 58.5	N51 29.3
S 09	340 22.8	333 07.6	· · 05.8	347 12.6	· · 16.8	279 31.2	· · 09.1	207 40.2	· · 41.8	Enif	34 14.0	N 9 46.2
U 10	355 25.3	348 10.8	04.9	2 13.3	16.1	294 33.1	09.2	222 42.6	41.8	Fomalhaut	15 54.3	S29 44.5
N 11	10 27.7	3 13.9	04.0	17 14.0	15.3	309 35.0	09.3	237 45.0	41.8			
D 12	25 30.2	18 17.0	N 9 03.1	32 14.6	S 4 14.5	324 36.9	N20 09.4	252 47.5	N18 41.8	Gacrux	172 30.7	S56 59.4
A 13	40 32.6	33 20.2	02.2	47 15.3	13.8	339 38.9	09.5	267 49.9	41.8	Gienah	176 20.0	S17 25.1
Y 14	55 35.1	48 23.3	01.3	62 16.0	13.0	354 40.8	09.6	282 52.3	41.7	Hadar	149 25.9	S60 15.9
15	70 37.6	63 26.5	9 00.4	77 16.7	· · 12.2	9 42.7	· · 09.7	297 54.8	· · 41.7	Hamal	328 31.9	N23 21.2
16	85 40.0	78 29.6	8 59.5	92 17.3	11.5	24 44.6	09.9	312 57.2	41.7	Kaus Aust.	84 19.8	S34 23.6
17	100 42.5	93 32.7	58.6	107 18.0	10.7	39 46.5	10.0	327 59.6	41.7			
18	115 45.0	108 35.8	N 8 57.7	122 18.7	S 4 09.9	54 48.4	N20 10.1	343 02.1	N18 41.7	Kochab	137 17.9	N74 14.9
19	130 47.4	123 39.0	56.8	137 19.4	09.1	69 50.3	10.2	358 04.5	41.7	Markab	14 05.7	N15 04.9
20	145 49.9	138 42.1	55.9	152 20.1	08.4	84 52.2	10.3	13 06.9	41.7	Menkar	314 43.9	N 3 59.9
21	160 52.4	153 45.2	· · 55.0	167 20.7	· · 07.6	99 54.2	· · 10.4	28 09.4	· · 41.7	Menkent	148 39.3	S36 15.6
22	175 54.8	168 48.3	54.1	182 21.4	06.8	114 56.1	10.5	43 11.8	41.7	Miaplacidus	221 45.0	S69 37.9
23	190 57.3	183 51.4	53.2	197 22.1	06.1	129 58.0	10.6	58 14.2	41.7			
18 00	205 59.8	198 54.5	N 8 52.3	212 22.8	S 4 05.3	144 59.9	N20 10.7	73 16.7	N18 41.7	Mirfak	309 19.8	N49 46.8
01	221 02.2	213 57.6	51.4	227 23.4	04.5	160 01.8	10.8	88 19.1	41.6	Nunki	76 31.9	S26 19.4
02	236 04.7	229 00.7	50.5	242 24.1	03.8	175 03.7	10.9	103 21.5	41.6	Peacock	54 02.1	S56 48.2
03	251 07.1	244 03.8	· · 49.6	257 24.8	· · 03.0	190 05.6	· · 11.0	118 24.0	· · 41.6	Pollux	244 01.0	N28 04.8
04	266 09.6	259 06.9	48.7	272 25.5	02.2	205 07.5	11.2	133 26.4	41.6	Procyon	245 28.2	N 5 16.8
05	281 12.1	274 09.9	47.8	287 26.1	01.5	220 09.4	11.3	148 28.8	41.6			
06	296 14.5	289 13.0	N 8 47.0	302 26.8	S 4 00.7	235 11.4	N20 11.4	163 31.3	N18 41.6	Rasalhague	96 31.5	N12 34.5
07	311 17.0	304 16.1	46.1	317 27.5	3 59.9	250 13.3	11.5	178 33.7	41.6	Regulus	208 12.3	N12 04.6
08	326 19.5	319 19.2	45.2	332 28.2	59.2	265 15.2	11.6	193 36.1	41.6	Rigel	281 38.5	S 8 13.9
M 09	341 21.9	334 22.2	· · 44.3	347 28.9	· · 58.4	280 17.1	· · 11.7	208 38.6	· · 41.6	Rigil Kent.	140 28.2	S60 44.4
O 10	356 24.4	349 25.3	43.4	2 29.5	57.6	295 19.0	11.8	223 41.0	41.6	Sabik	102 43.6	S15 41.8
N 11	11 26.9	4 28.4	42.5	17 30.2	56.9	310 20.9	11.9	238 43.4	41.6			
D 12	26 29.3	19 31.4	N 8 41.7	32 30.9	S 3 56.1	325 22.8	N20 12.0	253 45.9	N18 41.5	Schedar	350 12.1	N56 24.6
A 13	41 31.8	34 34.5	40.8	47 31.6	55.3	340 24.7	12.1	268 48.3	41.5	Shaula	96 58.7	S37 05.1
Y 14	56 34.3	49 37.5	39.9	62 32.3	54.6	355 26.6	12.2	283 50.7	41.5	Sirius	258 57.8	S16 41.4
15	71 36.7	64 40.6	· · 39.0	77 32.9	· · 53.8	10 28.6	· · 12.3	298 53.1	· · 41.5	Spica	158 59.7	S11 02.7
16	86 39.2	79 43.6	38.1	92 33.6	53.0	25 30.5	12.4	313 55.6	41.5	Suhail	223 12.3	S43 20.8
17	101 41.6	94 46.6	37.3	107 34.3	52.3	40 32.4	12.6	328 58.0	41.5			
18	116 44.1	109 49.7	N 8 36.4	122 35.0	S 3 51.5	55 34.3	N20 12.7	344 00.4	N18 41.5	Vega	80 57.3	N38 45.6
19	131 46.6	124 52.7	35.5	137 35.7	50.7	70 36.2	12.8	359 02.9	41.5	Zuben'ubi	137 35.3	S15 56.9
20	146 49.0	139 55.7	34.7	152 36.3	50.0	85 38.1	12.9	14 05.3	41.5			
21	161 51.5	154 58.7	· · 33.8	167 37.0	· · 49.2	100 40.0	· · 13.0	29 07.7	· · 41.5			
22	176 54.0	170 01.8	32.9	182 37.7	48.4	115 41.9	13.1	44 10.2	41.4			
23	191 56.4	185 04.8	32.1	197 38.4	47.7	130 43.8	13.2	59 12.6	41.4			
Mer. Pass.	h m 10 18.3	v 3.1	d 0.9	v 0.7	d 0.8	v 1.9	d 0.1	v 2.4	d 0.0			

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	352 38.5	10 47
Mars	7 05.9	9 51
Jupiter	299 13.4	14 21
Saturn	227 17.6	19 08

	G.M.T.	SUN G.H.A.	SUN Dec.	MOON G.H.A.	MOON v	MOON Dec.	MOON d	MOON H.P.
	d h	° ′	° ′	° ′	′	° ′	′	′
	16 00	180 01.5	N10 00.1	206 17.9	14.0	N 1 32.0	10.0	55.3
	01	195 01.6	01.0	220 50.9	14.1	1 42.0	9.9	55.3
	02	210 01.8	01.9	235 24.0	14.0	1 51.9	9.9	55.3
	03	225 01.9	·· 02.8	249 57.0	14.1	2 01.8	9.9	55.3
	04	240 02.1	03.7	264 30.1	14.1	2 11.7	9.9	55.3
	05	255 02.2	04.5	279 03.2	14.1	2 21.6	9.9	55.3
	06	270 02.4	N10 05.4	293 36.3	14.1	N 2 31.5	9.8	55.2
	07	285 02.5	06.3	308 09.4	14.1	2 41.3	9.9	55.2
S	08	300 02.7	07.2	322 42.5	14.1	2 51.2	9.8	55.2
A	09	315 02.8	·· 08.1	337 15.6	14.1	3 01.0	9.8	55.2
T	10	330 03.0	09.0	351 48.7	14.1	3 10.8	9.7	55.2
U	11	345 03.1	09.9	6 21.8	14.2	3 20.5	9.8	55.1
R	12	0 03.2	N10 10.8	20 55.0	14.1	N 3 30.3	9.7	55.1
D	13	15 03.4	11.6	35 28.1	14.2	3 40.0	9.8	55.1
A	14	30 03.5	12.5	50 01.3	14.1	3 49.8	9.6	55.1
Y	15	45 03.7	·· 13.4	64 34.4	14.2	3 59.4	9.7	55.1
	16	60 03.8	14.3	79 07.6	14.1	4 09.1	9.7	55.1
	17	75 04.0	15.2	93 40.7	14.2	4 18.8	9.6	55.0
	18	90 04.1	N10 16.1	108 13.9	14.1	N 4 28.4	9.6	55.0
	19	105 04.3	16.9	122 47.0	14.2	4 38.0	9.6	55.0
	20	120 04.4	17.8	137 20.2	14.2	4 47.6	9.5	55.0
	21	135 04.6	·· 18.7	151 53.4	14.2	4 57.1	9.5	55.0
	22	150 04.7	19.6	166 26.6	14.1	5 06.6	9.5	55.0
	23	165 04.9	20.5	180 59.7	14.2	5 16.1	9.5	55.0
	17 00	180 05.0	N10 21.4	195 32.9	14.2	N 5 25.6	9.4	54.9
	01	195 05.1	22.2	210 06.1	14.1	5 35.0	9.4	54.9
	02	210 05.3	23.1	224 39.2	14.2	5 44.4	9.4	54.9
	03	225 05.4	·· 24.0	239 12.4	14.2	5 53.8	9.4	54.9
	04	240 05.6	24.9	253 45.6	14.2	6 03.2	9.3	54.9
	05	255 05.7	25.8	268 18.8	14.1	6 12.5	9.3	54.9
	06	270 05.9	N10 26.6	282 51.9	14.2	N 6 21.8	9.2	54.8
	07	285 06.0	27.5	297 25.1	14.1	6 31.0	9.3	54.8
	08	300 06.2	28.4	311 58.2	14.2	6 40.3	9.1	54.8
S	09	315 06.3	·· 29.3	326 31.4	14.2	6 49.4	9.2	54.8
U	10	330 06.4	30.2	341 04.6	14.1	6 58.6	9.1	54.8
N	11	345 06.6	31.0	355 37.7	14.1	7 07.7	9.1	54.8
D	12	0 06.7	N10 31.9	10 10.8	14.2	N 7 16.8	9.0	54.8
A	13	15 06.9	32.8	24 44.0	14.1	7 25.8	9.1	54.7
Y	14	30 07.0	33.7	39 17.1	14.1	7 34.9	8.9	54.7
	15	45 07.2	·· 34.6	53 50.2	14.2	7 43.8	9.0	54.7
	16	60 07.3	35.4	68 23.4	14.1	7 52.8	8.9	54.7
	17	75 07.4	36.3	82 56.5	14.1	8 01.7	8.8	54.7
	18	90 07.6	N10 37.2	97 29.6	14.1	N 8 10.5	8.9	54.7
	19	105 07.7	38.1	112 02.7	14.0	8 19.4	8.7	54.7
	20	120 07.9	38.9	126 35.7	14.1	8 28.1	8.8	54.6
	21	135 08.0	·· 39.8	141 08.8	14.1	8 36.9	8.7	54.6
	22	150 08.2	40.7	155 41.9	14.1	8 45.6	8.6	54.6
	23	165 08.3	41.6	170 15.0	14.0	8 54.2	8.6	54.6
	18 00	180 08.4	N10 42.4	184 48.0	14.0	N 9 02.8	8.6	54.6
	01	195 08.6	43.3	199 21.0	14.1	9 11.4	8.5	54.6
	02	210 08.7	44.2	213 54.1	14.0	9 19.9	8.5	54.6
	03	225 08.9	·· 45.1	228 27.1	14.0	9 28.4	8.5	54.6
	04	240 09.0	45.9	243 00.1	14.0	9 36.9	8.4	54.5
	05	255 09.1	46.8	257 33.1	14.0	9 45.3	8.3	54.5
	06	270 09.3	N10 47.7					
	07	285 09.4	48.6					
	08	300 09.6	49.4					
M	09	315 09.7	·· 50.3					
O	10	330 09.8	51.2					
N	11	345 10.0	52.0					
D	12	0 10.1	N10 52.9	359 23.8	13.8	N10 42.7	8.0	54.4
A	13	15 10.3	53.8	13 56.6	13.9	10 50.7	8.0	54.4
Y	14	30 10.4	54.7	28 29.5	13.9	10 58.7	7.9	54.4
	15	45 10.5	·· 55.5	43 02.4	13.9	11 06.6	7.9	54.4
	16	60 10.7	56.4	57 35.3	13.8	11 14.5	7.8	54.4
	17	75 10.8	57.3	72 08.1	13.8	11 22.3	7.7	54.4
	18	90 10.9	N10 58.1	86 40.9	13.8	N11 30.0	7.7	54.4
	19	105 11.1	59.0	101 13.7	13.8	11 37.7	7.7	54.4
	20	120 11.2	10 59.9	115 46.5	13.8	11 45.4	7.6	54.4
	21	135 11.4	11 00.7	130 19.3	13.8	11 53.0	7.5	54.4
	22	150 11.5	01.6	144 52.1	13.7	12 00.5	7.5	54.3
	23	165 11.6	02.5	159 24.8	13.7	12 08.0	7.4	54.3
		S.D. 16.0	*d* 0.9	S.D. 15.0		14.9		14.8

An Annular Eclipse of the Sun occurs on this date. See page 5.

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 16	Moonrise 17	Moonrise 18	Moonrise 19
°	h m	h m	h m	h m	h m	h m	h m
N 72	////	01 39	03 28	03 56	03 50	03 44	03 37
N 70	////	02 21	03 47	03 59	03 58	03 58	03 59
68	////	02 49	04 01	04 01	04 05	04 10	04 17
66	01 25	03 10	04 13	04 03	04 11	04 20	04 31
64	02 03	03 27	04 23	04 05	04 16	04 28	04 42
62	02 29	03 40	04 31	04 06	04 20	04 35	04 52
60	02 49	03 51	04 38	04 08	04 24	04 41	05 01
N 58	03 04	04 01	04 44	04 09	04 27	04 46	05 08
56	03 17	04 09	04 50	04 10	04 30	04 51	05 15
54	03 29	04 17	04 55	04 11	04 33	04 56	05 21
52	03 38	04 23	04 59	04 12	04 35	05 00	05 26
50	03 47	04 29	05 04	04 12	04 37	05 03	05 31
45	04 04	04 42	05 12	04 14	04 42	05 11	05 42
N 40	04 18	04 51	05 20	04 15	04 46	05 18	05 51
35	04 29	05 00	05 26	04 17	04 50	05 23	05 58
30	04 38	05 07	05 31	04 18	04 53	05 28	06 05
20	04 52	05 18	05 41	04 20	04 58	05 37	06 17
N 10	05 02	05 27	05 49	04 21	05 03	05 44	06 27
0	05 11	05 35	05 56	04 23	05 07	05 52	06 37
S 10	05 18	05 42	06 04	04 25	05 12	05 59	06 46
20	05 23	05 49	06 11	04 27	05 17	06 07	06 57
30	05 28	05 56	06 20	04 29	05 22	06 16	07 09
35	05 30	05 59	06 25	04 30	05 26	06 21	07 15
40	05 32	06 03	06 31	04 31	05 29	06 27	07 23
45	05 33	06 07	06 37	04 33	05 34	06 34	07 33
S 50	05 35	06 12	06 45	04 35	05 39	06 42	07 44
52	05 35	06 14	06 49	04 35	05 41	06 46	07 49
54	05 35	06 16	06 53	04 36	05 44	06 50	07 55
56	05 36	06 19	06 57	04 38	05 47	06 55	08 01
58	05 36	06 21	07 02	04 39	05 50	07 00	08 08
S 60	05 36	06 24	07 07	04 40	05 54	07 06	08 16

Lat.	Sunset	Twilight Civil	Twilight Naut.	Moonset 16	Moonset 17	Moonset 18	Moonset 19
°	h m	h m	h m	h m	h m	h m	h m
N 72	20 35	22 30	////	17 40	19 19	20 58	22 41
N 70	20 16	21 43	////	17 34	19 06	20 37	22 08
68	20 01	21 14	////	17 29	18 55	20 21	21 45
66	19 49	20 52	22 42	17 25	18 47	20 08	21 26
64	19 39	20 35	22 01	17 21	18 40	19 57	21 12
62	19 30	20 21	21 34	17 18	18 34	19 48	20 59
60	19 23	20 10	21 14	17 15	18 28	19 40	20 49
N 58	19 16	20 00	20 57	17 13	18 24	19 33	20 40
56	19 10	19 51	20 44	17 11	18 19	19 27	20 32
54	19 05	19 44	20 32	17 09	18 16	19 21	20 25
52	19 01	19 37	20 23	17 07	18 12	19 16	20 18
50	18 57	19 31	20 14	17 06	18 09	19 12	20 13
45	18 48	19 19	19 56	17 02	18 03	19 02	20 00
N 40	18 40	19 08	19 42	16 59	17 57	18 54	19 50
35	18 34	19 00	19 31	16 57	17 52	18 47	19 41
30	18 28	18 53	19 22	16 55	17 48	18 41	19 34
20	18 19	18 41	19 08	16 51	17 41	18 31	19 21
N 10	18 11	18 32	18 57	16 48	17 35	18 22	19 09
0	18 03	18 24	18 48	16 44	17 29	18 13	18 59
S 10	17 55	18 17	18 41	16 41	17 23	18 05	18 48
20	17 47	18 10	18 36	16 38	17 16	17 56	18 36
30	17 39	18 03	18 31	16 34	17 09	17 45	18 23
35	17 34	17 59	18 29	16 32	17 05	17 40	18 16
40	17 28	17 55	18 27	16 30	17 01	17 33	18 07
45	17 21	17 51	18 25	16 27	16 55	17 25	17 57
S 50	17 13	17 46	18 24	16 23	16 49	17 16	17 45
52	17 10	17 44	18 23	16 22	16 46	17 11	17 40
54	17 06	17 42	18 23	16 20	16 43	17 07	17 34
56	17 01	17 39	18 22	16 18	16 39	17 01	17 27
58	16 56	17 37	18 22	16 16	16 35	16 56	17 19
S 60	16 51	17 34	18 22	16 14	16 31	16 49	17 11

Day	SUN Eqn. of Time 00ʰ	SUN Eqn. of Time 12ʰ	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
	m s	m s	h m	h m	h m	d	
16	00 06	00 13	12 00	10 34	22 56	28	●
17	00 20	00 27	12 00	11 18	23 40	29	
18	00 33	00 40	11 59	12 02	24 25	00	

1977 APRIL 19, 20, 21 (TUES., WED., THURS.)

G.M.T.		ARIES	VENUS −3.8		MARS +1.3		JUPITER −1.6		SATURN +0.4		STARS		
		G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	Name	S.H.A.	Dec.
d	h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	° ′
19	00	206 58.9	200 07.8	N 8 31.2	212 39.0	S 3 46.9	145 45.7	N20 13.3	74 15.0	N18 41.4	Acamar	315 39.4	S40 23.9
	01	222 01.4	215 10.8	30.3	227 39.7	46.1	160 47.6	13.4	89 17.4	41.4	Achernar	335 47.6	S57 21.1
	02	237 03.8	230 13.8	29.5	242 40.4	45.3	175 49.6	13.5	104 19.9	41.4	Acrux	173 39.1	S62 58.6
	03	252 06.3	245 16.8	·· 28.6	257 41.1	·· 44.6	190 51.5	·· 13.6	119 22.3	·· 41.4	Adhara	255 34.0	S28 56.8
	04	267 08.7	260 19.8	27.7	272 41.8	43.8	205 53.4	13.7	134 24.7	41.4	Aldebaran	291 20.9	N16 27.7
	05	282 11.2	275 22.8	26.9	287 42.4	43.0	220 55.3	13.8	149 27.2	41.4			
	06	297 13.7	290 25.8	N 8 26.0	302 43.1	S 3 42.3	235 57.2	N20 14.0	164 29.6	N18 41.4	Alioth	166 44.1	N56 05.0
	07	312 16.1	305 28.7	25.2	317 43.8	41.5	250 59.1	14.1	179 32.0	41.3	Alkaid	153 19.9	N49 25.5
	08	327 18.6	320 31.7	24.3	332 44.5	40.7	266 01.0	14.2	194 34.4	41.3	Al Na'ir	28 18.1	S47 04.1
T	09	342 21.1	335 34.7	·· 23.5	347 45.2	·· 40.0	281 02.9	·· 14.3	209 36.9	·· 41.3	Alnilam	276 14.2	S 1 13.2
U	10	357 23.5	350 37.7	22.6	2 45.9	39.2	296 04.8	14.4	224 39.3	41.3	Alphard	218 22.7	S 8 33.9
E	11	12 26.0	5 40.6	21.8	17 46.5	38.4	311 06.7	14.5	239 41.7	41.3			
S	12	27 28.5	20 43.6	N 8 20.9	32 47.2	S 3 37.7	326 08.6	N20 14.6	254 44.1	N18 41.3	Alphecca	126 33.8	N26 47.3
D	13	42 30.9	35 46.6	20.1	47 47.9	36.9	341 10.5	14.7	269 46.6	41.3	Alpheratz	358 12.0	N28 57.8
A	14	57 33.4	50 49.5	19.2	62 48.6	36.1	356 12.5	14.8	284 49.0	41.3	Altair	62 34.8	N 8 48.4
Y	15	72 35.9	65 52.5	·· 18.4	77 49.3	·· 35.4	11 14.4	·· 14.9	299 51.4	·· 41.3	Ankaa	353 43.0	S42 25.7
	16	87 38.3	80 55.4	17.5	92 49.9	34.6	26 16.3	15.0	314 53.8	41.3	Antares	112 59.4	S26 22.9
	17	102 40.8	95 58.4	16.7	107 50.6	33.8	41 18.2	15.1	329 56.3	41.2			
	18	117 43.2	111 01.3	N 8 15.9	122 51.3	S 3 33.0	56 20.1	N20 15.2	344 58.7	N18 41.2	Arcturus	146 20.2	N19 17.9
	19	132 45.7	126 04.2	15.0	137 52.0	32.3	71 22.0	15.4	0 01.1	41.2	Atria	108 25.3	S68 59.0
	20	147 48.2	141 07.2	14.2	152 52.7	31.5	86 23.9	15.5	15 03.5	41.2	Avior	234 29.1	S59 26.6
	21	162 50.6	156 10.1	·· 13.3	167 53.3	·· 30.7	101 25.8	·· 15.6	30 06.0	·· 41.2	Bellatrix	279 01.4	N 6 19.6
	22	177 53.1	171 13.0	12.5	182 54.0	30.0	116 27.7	15.7	45 08.4	41.2	Betelgeuse	271 31.0	N 7 24.0
	23	192 55.6	186 16.0	11.7	197 54.7	29.2	131 29.6	15.8	60 10.8	41.2			
20	00	207 58.0	201 18.9	N 8 10.8	212 55.4	S 3 28.4	146 31.5	N20 15.9	75 13.2	N18 41.2	Canopus	264 08.5	S52 41.4
	01	223 00.5	216 21.8	10.0	227 56.1	27.7	161 33.4	16.0	90 15.7	41.1	Capella	281 15.0	N45 58.6
	02	238 03.0	231 24.7	09.2	242 56.8	26.9	176 35.3	16.1	105 18.1	41.1	Deneb	49 50.1	N45 11.7
	03	253 05.4	246 27.6	·· 08.4	257 57.4	·· 26.1	191 37.2	·· 16.2	120 20.5	·· 41.1	Denebola	183 01.1	N14 41.8
	04	268 07.9	261 30.5	07.5	272 58.1	25.4	206 39.1	16.3	135 22.9	41.1	Diphda	349 23.5	S18 06.7
	05	283 10.4	276 33.4	06.7	287 58.8	24.6	221 41.0	16.4	150 25.4	41.1			
	06	298 12.8	291 36.3	N 8 05.9	302 59.5	S 3 23.8	236 43.0	N20 16.5	165 27.8	N18 41.1	Dubhe	194 24.6	N61 52.5
W	07	313 15.3	306 39.2	05.1	318 00.2	23.0	251 44.9	16.6	180 30.2	41.1	Elnath	278 47.3	N28 35.3
E	08	328 17.7	321 42.1	04.3	333 00.8	22.3	266 46.8	16.7	195 32.6	41.1	Eltanin	90 58.5	N51 29.3
D	09	343 20.2	336 45.0	·· 03.4	348 01.5	·· 21.5	281 48.7	·· 16.9	210 35.0	·· 41.1	Enif	34 14.0	N 9 46.2
N	10	358 22.7	351 47.8	02.6	3 02.2	20.7	296 50.6	17.0	225 37.5	41.0	Fomalhaut	15 54.2	S29 44.5
E	11	13 25.1	6 50.7	01.8	18 02.9	20.0	311 52.5	17.1	240 39.9	41.0			
S	12	28 27.6	21 53.6	N 8 01.0	33 03.6	S 3 19.2	326 54.4	N20 17.2	255 42.3	N18 41.0	Gacrux	172 30.7	S56 59.4
D	13	43 30.1	36 56.5	8 00.2	48 04.3	18.4	341 56.3	17.3	270 44.7	41.0	Gienah	176 20.0	S17 25.1
A	14	58 32.5	51 59.3	7 59.4	63 04.9	17.7	356 58.2	17.4	285 47.2	41.0	Hadar	149 25.9	S60 15.9
Y	15	73 35.0	67 02.2	·· 58.6	78 05.6	·· 16.9	12 00.1	·· 17.5	300 49.6	·· 41.0	Hamal	328 31.9	N23 21.2
	16	88 37.5	82 05.0	57.8	93 06.3	16.1	27 02.0	17.6	315 52.0	41.0	Kaus Aust.	84 19.7	S34 23.6
	17	103 39.9	97 07.9	56.9	108 07.0	15.4	42 03.9	17.7	330 54.4	41.0			
	18	118 42.4	112 10.7	N 7 56.1	123 07.7	S 3 14.6	57 05.8	N20 17.8	345 56.8	N18 40.9	Kochab	137 17.9	N74 14.9
	19	133 44.8	127 13.6	55.3	138 08.4	13.8	72 07.7	17.9	0 59.3	40.9	Markab	14 05.7	N15 04.9
	20	148 47.3	142 16.4	54.5	153 09.0	13.0	87 09.6	18.0	16 01.7	40.9	Menkar	314 43.9	N 3 59.9
	21	163 49.8	157 19.3	·· 53.7	168 09.7	·· 12.3	102 11.5	·· 18.1	31 04.1	·· 40.9	Menkent	148 39.3	S36 15.6
	22	178 52.2	172 22.1	52.9	183 10.4	11.5	117 13.4	18.2	46 06.5	40.9	Miaplacidus	221 45.1	S69 37.9
	23	193 54.7	187 24.9	52.1	198 11.1	10.7	132 15.3	18.4	61 08.9	40.9			
21	00	208 57.2	202 27.8	N 7 51.3	213 11.8	S 3 10.0	147 17.2	N20 18.5	76 11.4	N18 40.9	Mirfak	309 19.8	N49 46.8
	01	223 59.6	217 30.6	50.6	228 12.5	09.2	162 19.1	18.6	91 13.8	40.9	Nunki	76 31.9	S26 19.4
	02	239 02.1	232 33.4	49.8	243 13.1	08.4	177 21.0	18.7	106 16.2	40.8	Peacock	54 02.1	S56 48.2
	03	254 04.6	247 36.2	·· 49.0	258 13.8	·· 07.7	192 22.9	·· 18.8	121 18.6	·· 40.8	Pollux	244 01.0	N28 04.8
	04	269 07.0	262 39.0	48.2	273 14.5	06.9	207 24.8	18.9	136 21.0	40.8	Procyon	245 28.2	N 5 16.8
	05	284 09.5	277 41.8	47.4	288 15.2	06.1	222 26.8	19.0	151 23.5	40.8			
	06	299 12.0	292 44.6	N 7 46.6	303 15.9	S 3 05.3	237 28.7	N20 19.1	166 25.9	N18 40.8	Rasalhague	96 31.5	N12 34.5
	07	314 14.4	307 47.4	45.8	318 16.6	04.6	252 30.6	19.2	181 28.3	40.8	Regulus	208 12.3	N12 04.6
T	08	329 16.9	322 50.2	45.0	333 17.2	03.8	267 32.5	19.3	196 30.7	40.8	Rigel	281 38.5	S 8 13.9
H	09	344 19.3	337 53.0	·· 44.3	348 17.9	·· 03.0	282 34.4	·· 19.4	211 33.1	·· 40.8	Rigil Kent.	140 28.2	S60 44.4
U	10	359 21.8	352 55.8	43.5	3 18.6	02.3	297 36.3	19.5	226 35.5	40.7	Sabik	102 43.5	S15 41.8
R	11	14 24.3	7 58.6	42.7	18 19.3	01.5	312 38.2	19.6	241 38.0	40.7			
S	12	29 26.7	23 01.4	N 7 41.9	33 20.0	S 3 00.7	327 40.1	N20 19.7	256 40.4	N18 40.7	Schedar	350 12.1	N56 24.6
D	13	44 29.2	38 04.1	41.2	48 20.7	3 00.0	342 42.0	19.8	271 42.8	40.7	Shaula	96 58.6	S37 05.1
A	14	59 31.7	53 06.9	40.4	63 21.4	2 59.2	357 43.9	20.0	286 45.2	40.7	Sirius	258 57.9	S16 41.4
Y	15	74 34.1	68 09.7	·· 39.6	78 22.0	·· 58.4	12 45.8	·· 20.1	301 47.6	·· 40.7	Spica	158 59.6	S11 02.7
	16	89 36.6	83 12.4	38.8	93 22.7	57.6	27 47.7	20.2	316 50.0	40.7	Suhail	223 12.3	S43 20.8
	17	104 39.1	98 15.2	38.1	108 23.4	56.9	42 49.6	20.3	331 52.5	40.6			
	18	119 41.5	113 17.9	N 7 37.3	123 24.1	S 2 56.1	57 51.5	N20 20.4	346 54.9	N18 40.6	Vega	80 57.2	N38 45.6
	19	134 44.0	128 20.7	36.6	138 24.8	55.3	72 53.4	20.5	1 57.3	40.6	Zuben'ubi	137 35.3	S15 56.9
	20	149 46.5	143 23.4	35.8	153 25.5	54.6	87 55.3	20.6	16 59.7	40.6		S.H.A.	Mer. Pass.
	21	164 48.9	158 26.2	·· 35.0	168 26.1	·· 53.8	102 57.2	·· 20.7	32 02.1	·· 40.6		° ′	h m
	22	179 51.4	173 28.9	34.3	183 26.8	53.0	117 59.1	20.8	47 04.5	40.6	Venus	353 20.8	10 33
	23	194 53.8	188 31.7	33.5	198 27.5	52.2	133 01.0	20.9	62 07.0	40.6	Mars	4 57.4	9 48
Mer. Pass.		h m 10 06.5	v 2.9	d 0.8	v 0.7	d 0.8	v 1.9	d 0.1	v 2.4	d 0.0	Jupiter	298 33.5	14 12
											Saturn	227 15.2	18 56

G.M.T.		SUN		MOON				
		G.H.A.	Dec.	G.H.A.	v	Dec.	d	H.P.
d	h	° ′	° ′	° ′	′	° ′	′	′
19	00	180 11.8	N11 03.3	173 57.5	13.7	N12 15.4	7.4	54.3
	01	195 11.9	04.2	188 30.2	13.7	12 22.8	7.3	54.3
	02	210 12.0	05.1	203 02.9	13.7	12 30.1	7.3	54.3
	03	225 12.2	·· 05.9	217 35.6	13.7	12 37.4	7.2	54.3
	04	240 12.3	06.8	232 08.3	13.6	12 44.6	7.1	54.3
	05	255 12.5	07.7	246 40.9	13.7	12 51.7	7.1	54.3
	06	270 12.6	N11 08.5	261 13.6	13.6	N12 58.8	7.0	54.3
	07	285 12.7	09.4	275 46.2	13.6	13 05.8	7.0	54.3
	08	300 12.9	10.3	290 18.8	13.5	13 12.8	6.9	54.2
TUESDAY	09	315 13.0	·· 11.1	304 51.3	13.6	13 19.7	6.8	54.2
	10	330 13.1	12.0	319 23.9	13.5	13 26.5	6.8	54.2
	11	345 13.3	12.9	333 56.4	13.6	13 33.3	6.7	54.2
	12	0 13.4	N11 13.7	348 29.0	13.5	N13 40.0	6.7	54.2
	13	15 13.5	14.6	3 01.5	13.4	13 46.7	6.6	54.2
	14	30 13.7	15.5	17 33.9	13.5	13 53.3	6.5	54.2
	15	45 13.8	·· 16.3	32 06.4	13.5	13 59.8	6.5	54.2
	16	60 13.9	17.2	46 38.9	13.4	14 06.3	6.4	54.2
	17	75 14.1	18.0	61 11.3	13.4	14 12.7	6.3	54.2
	18	90 14.2	N11 18.9	75 43.7	13.4	N14 19.0	6.3	54.2
	19	105 14.3	19.8	90 16.1	13.4	14 25.3	6.2	54.2
	20	120 14.5	20.6	104 48.5	13.3	14 31.5	6.2	54.2
	21	135 14.6	·· 21.5	119 20.8	13.4	14 37.7	6.0	54.1
	22	150 14.7	22.4	133 53.2	13.3	14 43.7	6.0	54.1
	23	165 14.9	23.2	148 25.5	13.3	14 49.7	6.0	54.1
20	00	180 15.0	N11 24.1	162 57.8	13.2	N14 55.7	5.9	54.1
	01	195 15.1	24.9	177 30.0	13.3	15 01.6	5.8	54.1
	02	210 15.3	25.8	192 02.3	13.2	15 07.4	5.7	54.1
	03	225 15.4	·· 26.6	206 34.5	13.3	15 13.1	5.7	54.1
	04	240 15.5	27.5	221 06.8	13.2	15 18.8	5.6	54.1
	05	255 15.7	28.4	235 39.0	13.2	15 24.4	5.5	54.1
	06	270 15.8	N11 29.2	250 11.2	13.1	N15 29.9	5.5	54.1
WEDNESDAY	07	285 15.9	30.1	264 43.3	13.2	15 35.4	5.4	54.1
	08	300 16.1	30.9	279 15.5	13.1	15 40.8	5.3	54.1
	09	315 16.2	·· 31.8	293 47.6	13.1	15 46.1	5.3	54.1
	10	330 16.3	32.7	308 19.7	13.1	15 51.4	5.1	54.1
	11	345 16.5	33.5	322 51.8	13.1	15 56.5	5.1	54.1
	12	0 16.6	N11 34.4	337 23.9	13.0	N16 01.6	5.1	54.1
	13	15 16.7	35.2	351 55.9	13.0	16 06.7	4.9	54.1
	14	30 16.9	36.1	6 27.9	13.0	16 11.6	4.9	54.1
	15	45 17.0	·· 36.9	20 59.9	13.0	16 16.5	4.8	54.0
	16	60 17.1	37.8	35 31.9	13.0	16 21.3	4.8	54.0
	17	75 17.2	38.6	50 03.9	13.0	16 26.1	4.6	54.0
	18	90 17.4	N11 39.5	64 35.9	12.9	N16 30.7	4.6	54.0
	19	105 17.5	40.3	79 07.8	12.9	16 35.3	4.6	54.0
	20	120 17.6	41.2	93 39.7	12.9	16 39.9	4.4	54.0
	21	135 17.8	·· 42.1	108 11.6	12.9	16 44.3	4.4	54.0
	22	150 17.9	42.9	122 43.5	12.9	16 48.7	4.3	54.0
	23	165 18.0	43.8	137 15.4	12.8	16 53.0	4.2	54.0
21	00	180 18.1	N11 44.6	151 47.2	12.9	N16 57.2	4.1	54.0
	01	195 18.3	45.5	166 19.1	12.8	17 01.3	4.1	54.0
	02	210 18.4	46.3	180 50.9	12.8	17 05.4	3.9	54.0
	03	225 18.5	·· 47.2	195 22.7	12.7	17 09.3	3.9	54.0
	04	240 18.7	48.0	209 54.4	12.8	17 13.2	3.9	54.0
	05	255 18.8	48.9	224 26.2	12.7	17 17.1	3.7	54.0
	06	270 18.9	N11 49.7	238 57.9	12.8	N17 20.8	3.7	54.0
	07	285 19.0	50.6	253 29.7	12.7	17 24.5	3.6	54.0
THURSDAY	08	300 19.2	51.4	268 01.4	12.7	17 28.1	3.5	54.0
	09	315 19.3	·· 52.3	282 33.1	12.6	17 31.6	3.4	54.0
	10	330 19.4	53.1	297 04.7	12.7	17 35.0	3.4	54.0
	11	345 19.5	54.0	311 36.4	12.6	17 38.4	3.2	54.0
	12	0 19.7	N11 54.8	326 08.0	12.7	N17 41.6	3.2	54.0
	13	15 19.8	55.6	340 39.7	12.6	17 44.8	3.2	54.0
	14	30 19.9	56.5	355 11.3	12.6	17 48.0	3.0	54.0
	15	45 20.0	·· 57.3	9 42.9	12.6	17 51.0	2.9	54.0
	16	60 20.2	58.2	24 14.5	12.5	17 53.9	2.9	54.0
	17	75 20.3	59.0	38 46.0	12.6	17 56.8	2.8	54.0
	18	90 20.4	N11 59.9	53 17.6	12.5	N17 59.6	2.7	54.0
	19	105 20.6	12 00.7	67 49.1	12.5	18 02.3	2.6	54.0
	20	120 20.7	01.6	82 20.6	12.5	18 04.9	2.6	54.0
	21	135 20.8	·· 02.4	96 52.1	12.5	18 07.5	2.4	54.0
	22	150 20.9	03.3	111 23.6	12.5	18 09.9	2.4	54.0
	23	165 21.0	04.1	125 55.1	12.5	18 12.3	2.3	54.0
		S.D. 15.9	d 0.9	S.D. 14.8		14.7		14.7

Lat.	Twilight		Sunrise	Moonrise			
	Naut.	Civil		19	20	21	22
°	h m	h m	h m	h m	h m	h m	h m
N 72	////	00 58	03 10	03 37	03 28	03 15	▭
N 70	////	01 58	03 32	03 59	04 02	04 09	04 25
68	////	02 32	03 48	04 17	04 26	04 42	05 08
66	00 50	02 56	04 01	04 31	04 45	05 06	05 36
64	01 43	03 14	04 12	04 42	05 01	05 25	05 58
62	02 14	03 29	04 21	04 52	05 14	05 41	06 16
60	02 36	03 42	04 29	05 01	05 25	05 54	06 30
N 58	02 53	03 52	04 36	05 08	05 34	06 05	06 43
56	03 08	04 01	04 43	05 15	05 43	06 15	06 53
54	03 20	04 09	04 48	05 21	05 50	06 24	07 03
52	03 30	04 16	04 53	05 26	05 57	06 31	07 11
50	03 40	04 23	04 58	05 31	06 03	06 38	07 19
45	03 58	04 36	05 07	05 42	06 16	06 53	07 35
N 40	04 13	04 47	05 15	05 51	06 27	07 06	07 48
35	04 24	04 56	05 22	05 58	06 36	07 16	08 00
30	04 34	05 03	05 28	06 05	06 44	07 25	08 10
20	04 49	05 16	05 38	06 17	06 58	07 41	08 27
N 10	05 01	05 26	05 47	06 27	07 11	07 55	08 42
0	05 10	05 34	05 56	06 37	07 22	08 09	08 56
S 10	05 18	05 42	06 04	06 46	07 34	08 22	09 10
20	05 24	05 50	06 12	06 57	07 46	08 36	09 25
30	05 30	05 58	06 22	07 09	08 01	08 52	09 42
35	05 32	06 02	06 27	07 15	08 09	09 01	09 52
40	05 34	06 06	06 34	07 23	08 19	09 12	10 03
45	05 37	06 11	06 41	07 33	08 30	09 25	10 17
S 50	05 39	06 16	06 50	07 44	08 43	09 40	10 33
52	05 40	06 19	06 54	07 49	08 50	09 48	10 41
54	05 40	06 22	06 58	07 55	08 57	09 56	10 50
56	05 41	06 24	07 03	08 01	09 05	10 05	10 59
58	05 42	06 27	07 08	08 08	09 14	10 15	11 11
S 60	05 42	06 31	07 14	08 16	09 24	10 27	11 23

Lat.	Sunset	Twilight		Moonset			
		Civil	Naut.	19	20	21	22
°	h m	h m	h m	h m	h m	h m	h m
N 72	20 52	23 19	////	22 41	24 31	00 31	▭
N 70	20 30	22 06	////	22 08	23 37	24 58	00 58
68	20 13	21 31	////	21 45	23 04	24 16	00 16
66	19 59	21 06	23 24	21 26	22 41	23 47	24 43
64	19 48	20 46	22 21	21 12	22 22	23 26	24 20
62	19 38	20 31	21 48	20 59	22 07	23 08	24 02
60	19 30	20 18	21 25	20 49	21 54	22 54	23 47
N 58	19 23	20 08	21 07	20 40	21 43	22 42	23 34
56	19 17	19 58	20 52	20 32	21 34	22 31	23 23
54	19 11	19 50	20 40	20 25	21 25	22 22	23 13
52	19 06	19 43	20 29	20 18	21 18	22 14	23 05
50	19 01	19 36	20 20	20 13	21 11	22 06	22 57
45	18 51	19 23	20 01	20 00	20 57	21 50	22 40
N 40	18 43	19 12	19 46	19 50	20 45	21 37	22 27
35	18 36	19 03	19 34	19 41	20 34	21 26	22 15
30	18 30	18 55	19 24	19 34	20 26	21 16	22 05
20	18 20	18 42	19 09	19 21	20 10	20 59	21 48
N 10	18 11	18 32	18 57	19 09	19 57	20 45	21 33
0	18 02	18 23	18 48	18 59	19 44	20 31	21 19
S 10	17 54	18 15	18 40	18 48	19 32	20 18	21 04
20	17 45	18 08	18 34	18 36	19 19	20 03	20 49
30	17 35	18 00	18 28	18 23	19 04	19 46	20 32
35	17 30	17 56	18 25	18 16	18 55	19 37	20 22
40	17 24	17 51	18 23	18 07	18 45	19 26	20 10
45	17 16	17 46	18 20	17 57	18 33	19 12	19 57
S 50	17 07	17 41	18 18	17 45	18 19	18 57	19 40
52	17 03	17 38	18 17	17 40	18 12	18 49	19 32
54	16 59	17 35	18 17	17 34	18 05	18 41	19 23
56	16 54	17 32	18 16	17 27	17 57	18 32	19 14
58	16 49	17 29	18 15	17 19	17 47	18 21	19 03
S 60	16 42	17 26	18 14	17 11	17 37	18 09	18 50

Day	SUN			MOON			
	Eqn. of Time		Mer. Pass.	Mer. Pass.		Age	Phase
	00ʰ	12ʰ		Upper	Lower		
	m s	m s	h m	h m	h m	d	
19	00 47	00 53	11 59	12 48	00 25	01	●
20	01 00	01 06	11 59	13 33	01 10	02	
21	01 12	01 18	11 59	14 20	01 56	03	

1977 APRIL 22, 23, 24 (FRI., SAT., SUN.)

G.M.T.		ARIES	VENUS −3.9		MARS +1.3		JUPITER −1.6		SATURN +0.5	
		G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
d	h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
22	00	209 56.3	203 34.4	N 7 32.8	213 28.2	S 2 51.5	148 02.9	N20 21.0	77 09.4	N18 40.6
	01	224 58.8	218 37.1	32.0	228 28.9	50.7	163 04.8	21.1	92 11.8	40.5
	02	240 01.2	233 39.9	31.2	243 29.6	49.9	178 06.7	21.2	107 14.2	40.5
	03	255 03.7	248 42.6	·· 30.5	258 30.3	·· 49.2	193 08.6	·· 21.3	122 16.6	·· 40.5
	04	270 06.2	263 45.3	29.7	273 30.9	48.4	208 10.5	21.4	137 19.0	40.5
	05	285 08.6	278 48.0	29.0	288 31.6	47.6	223 12.4	21.6	152 21.4	40.5
	06	300 11.1	293 50.7	N 7 28.3	303 32.3	S 2 46.9	238 14.3	N20 21.7	167 23.9	N18 40.5
	07	315 13.6	308 53.4	27.5	318 33.0	46.1	253 16.2	21.8	182 26.3	40.5
	08	330 16.0	323 56.1	26.8	333 33.7	45.3	268 18.1	21.9	197 28.7	40.4
F	09	345 18.5	338 58.8	·· 26.0	348 34.4	·· 44.5	283 20.0	·· 22.0	212 31.1	·· 40.4
R	10	0 20.9	354 01.5	25.3	3 35.1	43.8	298 21.9	22.1	227 33.5	40.4
I	11	15 23.4	9 04.2	24.5	18 35.7	43.0	313 23.8	22.2	242 35.9	40.4
D	12	30 25.9	24 06.9	N 7 23.8	33 36.4	S 2 42.2	328 25.7	N20 22.3	257 38.3	N18 40.4
A	13	45 28.3	39 09.6	23.1	48 37.1	41.5	343 27.6	22.4	272 40.8	40.4
Y	14	60 30.8	54 12.2	22.3	63 37.8	40.7	358 29.5	22.5	287 43.2	40.4
	15	75 33.3	69 14.9	·· 21.6	78 38.5	·· 39.9	13 31.4	·· 22.6	302 45.6	·· 40.3
	16	90 35.7	84 17.6	20.9	93 39.2	39.1	28 33.3	22.7	317 48.0	40.3
	17	105 38.2	99 20.3	20.2	108 39.9	38.4	43 35.2	22.8	332 50.4	40.3
	18	120 40.7	114 22.9	N 7 19.4	123 40.6	S 2 37.6	58 37.1	N20 22.9	347 52.8	N18 40.3
	19	135 43.1	129 25.6	18.7	138 41.2	36.8	73 39.0	23.0	2 55.2	40.3
	20	150 45.6	144 28.2	18.0	153 41.9	36.1	88 40.9	23.2	17 57.6	40.3
	21	165 48.1	159 30.9	·· 17.3	168 42.6	·· 35.3	103 42.8	·· 23.3	33 00.0	·· 40.2
	22	180 50.5	174 33.5	16.5	183 43.3	34.5	118 44.7	23.4	48 02.5	40.2
	23	195 53.0	189 36.2	15.8	198 44.0	33.8	133 46.6	23.5	63 04.9	40.2
23	00	210 55.4	204 38.8	N 7 15.1	213 44.7	S 2 33.0	148 48.5	N20 23.6	78 07.3	N18 40.2
	01	225 57.9	219 41.5	14.4	228 45.4	32.2	163 50.4	23.7	93 09.7	40.2
	02	241 00.4	234 44.1	13.7	243 46.1	31.4	178 52.3	23.8	108 12.1	40.2
	03	256 02.8	249 46.7	·· 13.0	258 46.7	·· 30.7	193 54.2	·· 23.9	123 14.5	·· 40.2
	04	271 05.3	264 49.3	12.3	273 47.4	29.9	208 56.1	24.0	138 16.9	40.1
	05	286 07.8	279 52.0	11.6	288 48.1	29.1	223 58.0	24.1	153 19.3	40.1
	06	301 10.2	294 54.6	N 7 10.9	303 48.8	S 2 28.4	238 59.9	N20 24.2	168 21.7	N18 40.1
	07	316 12.7	309 57.2	10.2	318 49.5	27.6	254 01.8	24.3	183 24.1	40.1
S	08	331 15.2	324 59.8	09.5	333 50.2	26.8	269 03.7	24.4	198 26.6	40.1
A	09	346 17.6	340 02.4	·· 08.8	348 50.9	·· 26.0	284 05.6	·· 24.5	213 29.0	·· 40.1
T	10	1 20.1	355 05.0	08.1	3 51.6	25.3	299 07.5	24.6	228 31.4	40.0
U	11	16 22.6	10 07.6	07.4	18 52.2	24.5	314 09.4	24.7	243 33.8	40.0
R	12	31 25.0	25 10.2	N 7 06.7	33 52.9	S 2 23.7	329 11.3	N20 24.8	258 36.2	N18 40.0
D	13	46 27.5	40 12.8	06.0	48 53.6	23.0	344 13.1	25.0	273 38.6	40.0
A	14	61 29.9	55 15.4	05.3	63 54.3	22.2	359 15.0	25.1	288 41.0	40.0
Y	15	76 32.4	70 18.0	·· 04.6	78 55.0	·· 21.4	14 16.9	·· 25.2	303 43.4	·· 40.0
	16	91 34.9	85 20.5	03.9	93 55.7	20.6	29 18.8	25.3	318 45.8	40.0
	17	106 37.3	100 23.1	03.2	108 56.4	19.9	44 20.7	25.4	333 48.2	39.9
	18	121 39.8	115 25.7	N 7 02.5	123 57.1	S 2 19.1	59 22.6	N20 25.5	348 50.6	N18 39.9
	19	136 42.3	130 28.2	01.9	138 57.7	18.3	74 24.5	25.6	3 53.0	39.9
	20	151 44.7	145 30.8	01.2	153 58.4	17.6	89 26.4	25.7	18 55.5	39.9
	21	166 47.2	160 33.4	7 00.5	168 59.1	·· 16.8	104 28.3	·· 25.8	33 57.9	·· 39.9
	22	181 49.7	175 35.9	6 59.8	183 59.8	16.0	119 30.2	25.9	49 00.3	39.9
	23	196 52.1	190 38.5	59.1	199 00.5	15.2	134 32.1	26.0	64 02.7	39.8
24	00	211 54.6	205 41.0	N 6 58.5	214 01.2	S 2 14.5	149 34.0	N20 26.1	79 05.1	N18 39.8
	01	226 57.0	220 43.6	57.8	229 01.9	13.7	164 35.9	26.2	94 07.5	39.8
	02	241 59.5	235 46.1	57.1	244 02.6	12.9	179 37.8	26.3	109 09.9	39.8
	03	257 02.0	250 48.6	·· 56.5	259 03.3	·· 12.2	194 39.7	·· 26.4	124 12.3	·· 39.8
	04	272 04.4	265 51.2	55.8	274 03.9	11.4	209 41.6	26.5	139 14.7	39.8
	05	287 06.9	280 53.7	55.1	289 04.6	10.6	224 43.5	26.6	154 17.1	39.7
	06	302 09.4	295 56.2	N 6 54.5	304 05.3	S 2 09.8	239 45.4	N20 26.8	169 19.5	N18 39.7
	07	317 11.8	310 58.7	53.8	319 06.0	09.1	254 47.3	26.9	184 21.9	39.7
	08	332 14.3	326 01.3	53.2	334 06.7	08.3	269 49.2	27.0	199 24.3	39.7
S	09	347 16.8	341 03.8	·· 52.5	349 07.4	·· 07.5	284 51.1	·· 27.1	214 26.7	·· 39.7
U	10	2 19.2	356 06.3	51.8	4 08.1	06.8	299 53.0	27.2	229 29.1	39.7
N	11	17 21.7	11 08.8	51.2	19 08.8	06.0	314 54.9	27.3	244 31.5	39.6
D	12	32 24.2	26 11.3	N 6 50.5	34 09.5	S 2 05.2	329 56.8	N20 27.4	259 33.9	N18 39.6
A	13	47 26.6	41 13.8	49.9	49 10.2	04.4	344 58.6	27.5	274 36.3	39.6
Y	14	62 29.1	56 16.3	49.2	64 10.8	03.7	0 00.5	27.6	289 38.7	39.6
	15	77 31.5	71 18.8	·· 48.6	79 11.5	·· 02.9	15 02.4	·· 27.7	304 41.1	·· 39.6
	16	92 34.0	86 21.2	47.9	94 12.2	02.1	30 04.3	27.8	319 43.5	39.6
	17	107 36.5	101 23.7	47.3	109 12.9	01.4	45 06.2	27.9	334 46.0	39.5
	18	122 38.9	116 26.2	N 6 46.7	124 13.6	S 2 00.6	60 08.1	N20 28.0	349 48.4	N18 39.5
	19	137 41.4	131 28.7	46.0	139 14.3	1 59.8	75 10.0	28.1	4 50.8	39.5
	20	152 43.9	146 31.2	45.4	154 15.0	59.0	90 11.9	28.2	19 53.2	39.5
	21	167 46.3	161 33.6	·· 44.8	169 15.7	·· 58.3	105 13.8	·· 28.3	34 55.6	·· 39.5
	22	182 48.8	176 36.1	44.1	184 16.4	57.5	120 15.7	28.4	49 58.0	39.5
	23	197 51.3	191 38.5	43.5	199 17.1	56.7	135 17.6	28.5	65 00.4	39.4
Mer. Pass.		h m 9 54.7	v 2.6	d 0.7	v 0.7	d 0.8	v 1.9	d 0.1	v 2.4	d 0.0

STARS

Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 39.4	S40 23.9
Achernar	335 47.6	S57 21.1
Acrux	173 39.1	S62 58.6
Adhara	255 34.0	S28 56.8
Aldebaran	291 20.9	N16 27.7
Alioth	166 44.1	N56 05.0
Alkaid	153 19.9	N49 25.6
Al Na'ir	28 18.1	S47 04.1
Alnilam	276 14.2	S 1 13.2
Alphard	218 22.7	S 8 33.9
Alphecca	126 33.7	N26 47.4
Alpheratz	358 12.0	N28 57.8
Altair	62 34.7	N 8 48.4
Ankaa	353 42.9	S42 25.7
Antares	112 59.4	S26 22.9
Arcturus	146 20.2	N19 17.9
Atria	108 25.2	S68 59.0
Avior	234 29.1	S59 26.6
Bellatrix	279 01.4	N 6 19.6
Betelgeuse	271 31.0	N 7 24.0
Canopus	264 08.5	S52 41.4
Capella	281 15.0	N45 58.5
Deneb	49 50.0	N45 11.7
Denebola	183 01.1	N14 41.8
Diphda	349 23.5	S18 06.7
Dubhe	194 24.6	N61 52.5
Elnath	278 47.3	N28 35.3
Eltanin	90 58.5	N51 29.3
Enif	34 13.9	N 9 46.2
Fomalhaut	15 54.2	S29 44.5
Gacrux	172 30.7	S56 59.4
Gienah	176 20.0	S17 25.2
Hadar	149 25.9	S60 15.9
Hamal	328 31.9	N23 21.2
Kaus Aust.	84 19.7	S34 23.6
Kochab	137 17.9	N74 14.9
Markab	14 05.7	N15 04.9
Menkar	314 43.9	N 3 59.9
Menkent	148 39.3	S36 15.6
Miaplacidus	221 45.1	S69 37.9
Mirfak	309 19.8	N49 46.8
Nunki	76 31.9	S26 19.4
Peacock	54 02.1	S56 48.2
Pollux	244 01.1	N28 04.8
Procyon	245 28.3	N 5 16.8
Rasalhague	96 31.5	N12 34.5
Regulus	208 12.3	N12 04.6
Rigel	281 38.5	S 8 13.9
Rigil Kent.	140 28.2	S60 44.5
Sabik	102 43.5	S15 41.8
Schedar	350 12.1	N56 24.6
Shaula	96 58.6	S37 05.1
Sirius	258 57.9	S16 41.4
Spica	158 59.6	S11 02.7
Suhail	223 12.3	S43 20.8
Vega	80 57.2	N38 45.6
Zuben'ubi	137 35.2	S15 56.9

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	353 43.4	10 20
Mars	2 49.2	9 45
Jupiter	297 53.0	14 03
Saturn	227 11.8	18 45

G.M.T.		SUN		MOON				
		G.H.A.	Dec.	G.H.A.	v	Dec.	d	H.P.
d	h	° ′	° ′	° ′	′	° ′	′	′
22	00	180 21.2	N12 04.9	140 26.6	12.4	N18 14.6	2.2	54.0
	01	195 21.3	05.8	154 58.0	12.5	18 16.8	2.1	54.0
	02	210 21.4	06.6	169 29.5	12.4	18 18.9	2.1	54.0
	03	225 21.5	·· 07.5	184 00.9	12.4	18 21.0	1.9	54.0
	04	240 21.7	08.3	198 32.3	12.4	18 22.9	1.9	54.0
	05	255 21.8	09.2	213 03.7	12.4	18 24.8	1.8	54.0
	06	270 21.9	N12 10.0	227 35.1	12.4	N18 26.6	1.7	54.0
	07	285 22.0	10.8	242 06.5	12.3	18 28.3	1.6	54.0
	08	300 22.2	11.7	256 37.8	12.4	18 29.9	1.6	54.0
F	09	315 22.3	·· 12.5	271 09.2	12.3	18 31.5	1.4	54.1
R	10	330 22.4	13.4	285 40.5	12.3	18 32.9	1.4	54.1
I	11	345 22.5	14.2	300 11.8	12.4	18 34.3	1.3	54.1
D	12	0 22.6	N12 15.0	314 43.2	12.3	N18 35.6	1.2	54.1
A	13	15 22.8	15.9	329 14.5	12.3	18 36.8	1.1	54.1
Y	14	30 22.9	16.7	343 45.8	12.2	18 37.9	1.0	54.1
	15	45 23.0	·· 17.6	358 17.0	12.3	18 38.9	0.9	54.1
	16	60 23.1	18.4	12 48.3	12.3	18 39.8	0.9	54.1
	17	75 23.3	19.2	27 19.6	12.2	18 40.7	0.8	54.1
	18	90 23.4	N12 20.1	41 50.8	12.3	N18 41.5	0.7	54.1
	19	105 23.5	20.9	56 22.1	12.2	18 42.2	0.6	54.1
	20	120 23.6	21.7	70 53.3	12.2	18 42.8	0.5	54.1
	21	135 23.7	·· 22.6	85 24.5	12.3	18 43.3	0.4	54.1
	22	150 23.9	23.4	99 55.8	12.2	18 43.7	0.3	54.1
	23	165 24.0	24.3	114 27.0	12.2	18 44.0	0.3	54.1
23	00	180 24.1	N12 25.1	128 58.2	12.2	N18 44.3	0.2	54.1
	01	195 24.2	25.9	143 29.4	12.2	18 44.5	0.0	54.2
	02	210 24.3	26.8	158 00.6	12.2	18 44.5	0.0	54.2
	03	225 24.5	·· 27.6	172 31.8	12.1	18 44.5	0.1	54.2
	04	240 24.6	28.4	187 02.9	12.2	18 44.4	0.1	54.2
	05	255 24.7	29.3	201 34.1	12.2	18 44.3	0.3	54.2
	06	270 24.8	N12 30.1	216 05.3	12.1	N18 44.0	0.4	54.2
	07	285 24.9	30.9	230 36.4	12.2	18 43.6	0.4	54.2
S	08	300 25.0	31.8	245 07.6	12.1	18 43.2	0.5	54.2
A	09	315 25.2	·· 32.6	259 38.7	12.1	18 42.7	0.6	54.2
T	10	330 25.3	33.4	274 09.8	12.2	18 42.1	0.7	54.2
U	11	345 25.4	34.3	288 41.0	12.1	18 41.4	0.8	54.2
R	12	0 25.5	N12 35.1	303 12.1	12.1	N18 40.6	0.9	54.3
D	13	15 25.6	35.9	317 43.2	12.1	18 39.7	0.9	54.3
A	14	30 25.7	36.7	332 14.3	12.1	18 38.8	1.1	54.3
Y	15	45 25.9	·· 37.6	346 45.4	12.1	18 37.7	1.1	54.3
	16	60 26.0	38.4	1 16.5	12.1	18 36.6	1.2	54.3
	17	75 26.1	39.2	15 47.6	12.1	18 35.4	1.4	54.3
	18	90 26.2	N12 40.1	30 18.7	12.1	N18 34.0	1.4	54.3
	19	105 26.3	40.9	44 49.8	12.1	18 32.6	1.4	54.3
	20	120 26.4	41.7	59 20.9	12.1	18 31.2	1.6	54.4
	21	135 26.6	·· 42.5	73 52.0	12.1	18 29.6	1.7	54.4
	22	150 26.7	43.4	88 23.1	12.1	18 27.9	1.7	54.4
	23	165 26.8	44.2	102 54.2	12.1	18 26.2	1.8	54.4
24	00	180 26.9	N12 45.0	117 25.3	12.0	N18 24.4	1.9	54.4
	01	195 27.0	45.9	131 56.3	12.1	18 22.5	2.0	54.4
	02	210 27.1	46.7	146 27.4	12.1	18 20.5	2.1	54.4
	03	225 27.2	·· 47.5	160 58.5	12.1	18 18.4	2.2	54.5
	04	240 27.4	48.3	175 29.6	12.0	18 16.2	2.3	54.5
	05	255 27.5	49.2	190 00.6	12.1	18 13.9	2.3	54.5
	06	270 27.6	N12 50.0	204 31.7	12.1	N18 11.6	2.4	54.5
	07	285 27.7	50.8	219 02.8	12.0	18 09.2	2.6	54.5
	08	300 27.8	51.6	233 33.8	12.1	18 06.6	2.6	54.5
S	09	315 27.9	·· 52.5	248 04.9	12.1	18 04.0	2.7	54.5
U	10	330 28.0	53.3	262 36.0	12.0	18 01.3	2.7	54.6
N	11	345 28.2	54.1	277 07.0	12.1	17 58.6	2.9	54.6
D	12	0 28.3	N12 54.9	291 38.1	12.0	N17 55.7	3.0	54.6
A	13	15 28.4	55.7	306 09.1	12.1	17 52.7	3.0	54.6
Y	14	30 28.5	56.6	320 40.2	12.1	17 49.7	3.1	54.6
	15	45 28.6	·· 57.4	335 11.3	12.0	17 46.6	3.2	54.6
	16	60 28.7	58.2	349 42.3	12.1	17 43.4	3.3	54.7
	17	75 28.8	59.0	4 13.4	12.0	17 40.1	3.4	54.7
	18	90 28.9	N12 59.8	18 44.4	12.1	N17 36.7	3.4	54.7
	19	105 29.1	13 00.7	33 15.5	12.0	17 33.3	3.6	54.7
	20	120 29.2	01.5	47 46.5	12.1	17 29.7	3.6	54.7
	21	135 29.3	·· 02.3	62 17.6	12.1	17 26.1	3.7	54.8
	22	150 29.4	03.1	76 48.7	12.0	17 22.4	3.8	54.8
	23	165 29.5	03.9	91 19.7	12.1	17 18.6	3.9	54.8
		S.D. 15.9	d 0.8	S.D.	14.7	14.8		14.9

Lat.	Twilight		Sunrise	Moonrise			
	Naut.	Civil		22	23	24	25
°	h m	h m	h m	h m	h m	h m	h m
N 72	////	////	02 51	□	□	□	06 41
N 70	////	01 31	03 16	04 25	05 02	06 07	07 31
68	////	02 13	03 35	05 08	05 49	06 48	08 02
66	////	02 41	03 49	05 36	06 19	07 16	08 26
64	01 20	03 02	04 02	05 58	06 42	07 38	08 44
62	01 57	03 18	04 12	06 16	07 00	07 55	08 59
60	02 23	03 32	04 21	06 30	07 15	08 09	09 11
N 58	02 42	03 43	04 28	06 43	07 28	08 21	09 22
56	02 58	03 53	04 35	06 53	07 39	08 32	09 31
54	03 11	04 02	04 41	07 03	07 49	08 41	09 39
52	03 23	04 10	04 47	07 11	07 57	08 49	09 47
50	03 32	04 16	04 52	07 19	08 05	08 57	09 54
45	03 52	04 31	05 02	07 35	08 22	09 13	10 08
N 40	04 08	04 42	05 11	07 48	08 35	09 26	10 20
35	04 20	04 52	05 18	08 00	08 47	09 37	10 30
30	04 31	05 00	05 25	08 10	08 57	09 46	10 38
20	04 47	05 13	05 36	08 27	09 14	10 03	10 53
N 10	04 59	05 24	05 46	08 42	09 29	10 17	11 07
0	05 09	05 34	05 55	08 56	09 43	10 31	11 19
S 10	05 18	05 42	06 04	09 10	09 57	10 45	11 31
20	05 25	05 51	06 13	09 25	10 12	10 59	11 44
30	05 31	05 59	06 24	09 42	10 30	11 16	11 59
35	05 34	06 04	06 30	09 52	10 40	11 25	12 08
40	05 37	06 09	06 37	10 03	10 51	11 36	12 18
45	05 40	06 14	06 45	10 17	11 05	11 49	12 29
S 50	05 43	06 21	06 54	10 33	11 22	12 05	12 43
52	05 44	06 24	06 59	10 41	11 29	12 12	12 50
54	05 45	06 27	07 03	10 50	11 38	12 21	12 57
56	05 46	06 30	07 09	10 59	11 48	12 30	13 05
58	05 48	06 34	07 15	11 11	11 59	12 40	13 14
S 60	05 49	06 38	07 21	11 23	12 12	12 52	13 25

Lat.	Sunset	Twilight		Moonset			
		Civil	Naut.	22	23	24	25
°	h m	h m	h m	h m	h m	h m	h m
N 72	21 10	////	////	□	□	□	03 41
N 70	20 44	22 35	////	00 58	02 00	02 34	02 50
68	20 25	21 49	////	00 16	01 13	01 53	02 18
66	20 10	21 20	////	24 43	00 43	01 24	01 54
64	19 57	20 58	22 45	24 20	00 20	01 03	01 35
62	19 47	20 41	22 04	24 02	00 02	00 45	01 20
60	19 38	20 27	21 37	23 47	24 31	00 31	01 07
N 58	19 30	20 15	21 17	23 34	24 19	00 19	00 56
56	19 23	20 05	21 01	23 23	24 08	00 08	00 47
54	19 17	19 56	20 47	23 13	23 59	24 38	00 38
52	19 11	19 48	20 36	23 05	23 50	24 30	00 30
50	19 06	19 41	20 26	22 57	23 43	24 23	00 23
45	18 55	19 27	20 05	22 40	23 26	24 09	00 09
N 40	18 46	19 15	19 50	22 27	23 13	23 56	24 36
35	18 39	19 05	19 37	22 15	23 02	23 46	24 27
30	18 32	18 57	19 27	22 05	22 52	23 37	24 19
20	18 21	18 43	19 10	21 48	22 35	23 21	24 05
N 10	18 11	18 32	18 58	21 33	22 20	23 07	23 53
0	18 02	18 23	18 47	21 19	22 06	22 54	23 42
S 10	17 53	18 14	18 39	21 04	21 52	22 41	23 30
20	17 43	18 06	18 32	20 49	21 37	22 27	23 18
30	17 32	17 57	18 25	20 32	21 20	22 11	23 04
35	17 26	17 52	18 22	20 22	21 10	22 02	22 56
40	17 19	17 47	18 19	20 10	20 59	21 51	22 47
45	17 11	17 41	18 16	19 57	20 45	21 38	22 36
S 50	17 02	17 35	18 13	19 40	20 29	21 23	22 22
52	16 57	17 32	18 12	19 32	20 21	21 16	22 16
54	16 52	17 29	18 10	19 23	20 12	21 08	22 09
56	16 47	17 26	18 09	19 14	20 03	20 59	22 01
58	16 41	17 22	18 08	19 03	19 52	20 49	21 53
S 60	16 34	17 18	18 07	18 50	19 39	20 37	21 43

Day	SUN			MOON			
	Eqn. of Time 00ʰ	12ʰ	Mer. Pass.	Mer. Pass. Upper	Lower	Age	Phase
	m s	m s	h m	h m	h m	d	
22	01 24	01 30	11 58	15 07	02 43	04	
23	01 36	01 42	11 58	15 55	03 31	05	🌒
24	01 47	01 53	11 58	16 43	04 19	06	

1977 APRIL 25, 26, 27 (MON., TUES., WED.)

G.M.T.		ARIES	VENUS −4.0		MARS +1.3		JUPITER −1.6		SATURN +0.5	
d	h	G.H.A. ° ′	G.H.A. ° ′	Dec. ° ′	G.H.A. ° ′	Dec. ° ′	G.H.A. ° ′	Dec. ° ′	G.H.A. ° ′	Dec. ° ′
25	00	212 53.7	206 41.0	N 6 42.9	214 17.7	S 1 56.0	150 19.5	N20 28.7	80 02.8	N18 39.4
	01	227 56.2	221 43.5	42.2	229 18.4	55.2	165 21.4	28.8	95 05.2	39.4
	02	242 58.7	236 45.9	41.6	244 19.1	54.4	180 23.3	28.9	110 07.6	39.4
	03	258 01.1	251 48.3	·· 41.0	259 19.8	·· 53.6	195 25.2	·· 29.0	125 10.0	·· 39.4
	04	273 03.6	266 50.8	40.4	274 20.5	52.9	210 27.1	29.1	140 12.4	39.3
	05	288 06.0	281 53.2	39.7	289 21.2	52.1	225 28.9	29.2	155 14.8	39.3
	06	303 08.5	296 55.7	N 6 39.1	304 21.9	S 1 51.3	240 30.8	N20 29.3	170 17.2	N18 39.3
	07	318 11.0	311 58.1	38.5	319 22.6	50.6	255 32.7	29.4	185 19.6	39.3
	08	333 13.4	327 00.5	37.9	334 23.3	49.8	270 34.6	29.5	200 22.0	39.3
MONDAY	09	348 15.9	342 02.9	·· 37.3	349 24.0	·· 49.0	285 36.5	·· 29.6	215 24.4	·· 39.3
	10	3 18.4	357 05.4	36.7	4 24.7	48.2	300 38.4	29.7	230 26.8	39.2
	11	18 20.8	12 07.8	36.1	19 25.3	47.5	315 40.3	29.8	245 29.2	39.2
	12	33 23.3	27 10.2	N 6 35.5	34 26.0	S 1 46.7	330 42.2	N20 29.9	260 31.6	N18 39.2
	13	48 25.8	42 12.6	34.9	49 26.7	45.9	345 44.1	30.0	275 34.0	39.2
	14	63 28.2	57 15.0	34.2	64 27.4	45.2	0 46.0	30.1	290 36.4	39.2
	15	78 30.7	72 17.4	·· 33.6	79 28.1	·· 44.4	15 47.9	·· 30.2	305 38.8	·· 39.2
	16	93 33.1	87 19.8	33.0	94 28.8	43.6	30 49.8	30.3	320 41.2	39.1
	17	108 35.6	102 22.2	32.4	109 29.5	42.8	45 51.7	30.4	335 43.6	39.1
	18	123 38.1	117 24.6	N 6 31.9	124 30.2	S 1 42.1	60 53.5	N20 30.5	350 46.0	N18 39.1
	19	138 40.5	132 26.9	31.3	139 30.9	41.3	75 55.4	30.7	5 48.4	39.1
	20	153 43.0	147 29.3	30.7	154 31.6	40.5	90 57.3	30.8	20 50.8	39.1
	21	168 45.5	162 31.7	·· 30.1	169 32.3	·· 39.8	105 59.2	·· 30.9	35 53.2	·· 39.0
	22	183 47.9	177 34.1	29.5	184 33.0	39.0	121 01.1	31.0	50 55.6	39.0
	23	198 50.4	192 36.4	28.9	199 33.6	38.2	136 03.0	31.1	65 58.0	39.0
26	00	213 52.9	207 38.8	N 6 28.3	214 34.3	S 1 37.4	151 04.9	N20 31.2	81 00.3	N18 39.0
	01	228 55.3	222 41.2	27.7	229 35.0	36.7	166 06.8	31.3	96 02.7	39.0
	02	243 57.8	237 43.5	27.2	244 35.7	35.9	181 08.7	31.4	111 05.1	38.9
	03	259 00.3	252 45.9	·· 26.6	259 36.4	·· 35.1	196 10.6	·· 31.5	126 07.5	·· 38.9
	04	274 02.7	267 48.2	26.0	274 37.1	34.4	211 12.5	31.6	141 09.9	38.9
	05	289 05.2	282 50.6	25.4	289 37.8	33.6	226 14.3	31.7	156 12.3	38.9
	06	304 07.6	297 52.9	N 6 24.9	304 38.5	S 1 32.8	241 16.2	N20 31.8	171 14.7	N18 38.9
	07	319 10.1	312 55.3	24.3	319 39.2	32.0	256 18.1	31.9	186 17.1	38.9
TUESDAY	08	334 12.6	327 57.6	23.7	334 39.9	31.3	271 20.0	32.0	201 19.5	38.8
	09	349 15.0	342 59.9	·· 23.1	349 40.6	·· 30.5	286 21.9	·· 32.1	216 21.9	·· 38.8
	10	4 17.5	358 02.3	22.6	4 41.3	29.7	301 23.8	32.2	231 24.3	38.8
	11	19 20.0	13 04.6	22.0	19 42.0	29.0	316 25.7	32.3	246 26.7	38.8
	12	34 22.4	28 06.9	N 6 21.5	34 42.6	S 1 28.2	331 27.6	N20 32.4	261 29.1	N18 38.8
	13	49 24.9	43 09.2	20.9	49 43.3	27.4	346 29.5	32.5	276 31.5	38.7
	14	64 27.4	58 11.5	20.3	64 44.0	26.6	1 31.4	32.6	291 33.9	38.7
	15	79 29.8	73 13.8	·· 19.8	79 44.7	·· 25.9	16 33.2	·· 32.7	306 36.3	·· 38.7
	16	94 32.3	88 16.2	19.2	94 45.4	25.1	31 35.1	32.9	321 38.7	38.7
	17	109 34.8	103 18.5	18.7	109 46.1	24.3	46 37.0	33.0	336 41.1	38.7
	18	124 37.2	118 20.8	N 6 18.1	124 46.8	S 1 23.6	61 38.9	N20 33.1	351 43.5	N18 38.6
	19	139 39.7	133 23.0	17.6	139 47.5	22.8	76 40.8	33.2	6 45.9	38.6
	20	154 42.1	148 25.3	17.0	154 48.2	22.0	91 42.7	33.3	21 48.3	38.6
	21	169 44.6	163 27.6	·· 16.5	169 48.9	·· 21.2	106 44.6	·· 33.4	36 50.6	·· 38.6
	22	184 47.1	178 29.9	15.9	184 49.6	20.5	121 46.5	33.5	51 53.0	38.6
	23	199 49.5	193 32.2	15.4	199 50.3	19.7	136 48.4	33.6	66 55.4	38.5
27	00	214 52.0	208 34.5	N 6 14.9	214 51.0	S 1 18.9	151 50.3	N20 33.7	81 57.8	N18 38.5
	01	229 54.5	223 36.7	14.3	229 51.7	18.2	166 52.1	33.8	97 00.2	38.5
	02	244 56.9	238 39.0	13.8	244 52.4	17.4	181 54.0	33.9	112 02.6	38.5
	03	259 59.4	253 41.3	·· 13.3	259 53.0	·· 16.6	196 55.9	·· 34.0	127 05.0	·· 38.5
	04	275 01.9	268 43.5	12.7	274 53.7	15.8	211 57.8	34.1	142 07.4	38.4
	05	290 04.3	283 45.8	12.2	289 54.4	15.1	226 59.7	34.2	157 09.8	38.4
	06	305 06.8	298 48.0	N 6 11.7	304 55.1	S 1 14.3	242 01.6	N20 34.3	172 12.2	N18 38.4
WEDNESDAY	07	320 09.2	313 50.3	11.1	319 55.8	13.5	257 03.5	34.4	187 14.6	38.4
	08	335 11.7	328 52.5	10.6	334 56.5	12.8	272 05.4	34.5	202 17.0	38.4
	09	350 14.2	343 54.8	·· 10.1	349 57.2	·· 12.0	287 07.2	·· 34.6	217 19.3	·· 38.3
	10	5 16.6	358 57.0	09.6	4 57.9	11.2	302 09.1	34.7	232 21.7	38.3
	11	20 19.1	13 59.3	09.1	19 58.6	10.4	317 11.0	34.8	247 24.1	38.3
	12	35 21.6	29 01.5	N 6 08.5	34 59.3	S 1 09.7	332 12.9	N20 34.9	262 26.5	N18 38.3
	13	50 24.0	44 03.7	08.0	50 00.0	08.9	347 14.8	35.0	277 28.9	38.3
	14	65 26.5	59 06.0	07.5	65 00.7	08.1	2 16.7	35.1	292 31.3	38.2
	15	80 29.0	74 08.2	·· 07.0	80 01.4	·· 07.4	17 18.6	·· 35.2	307 33.7	·· 38.2
	16	95 31.4	89 10.4	06.5	95 02.1	06.6	32 20.5	35.4	322 36.1	38.2
	17	110 33.9	104 12.6	06.0	110 02.8	05.8	47 22.3	35.5	337 38.5	38.2
	18	125 36.4	119 14.8	N 6 05.5	125 03.5	S 1 05.0	62 24.2	N20 35.6	352 40.9	N18 38.2
	19	140 38.8	134 17.0	05.0	140 04.2	04.3	77 26.1	35.7	7 43.2	38.1
	20	155 41.3	149 19.2	04.5	155 04.8	03.5	92 28.0	35.8	22 45.6	38.1
	21	170 43.7	164 21.4	·· 04.0	170 05.5	·· 02.7	107 29.9	·· 35.9	37 48.0	·· 38.1
	22	185 46.2	179 23.6	03.5	185 06.2	02.0	122 31.8	36.0	52 50.4	38.1
	23	200 48.7	194 25.8	03.0	200 06.9	01.2	137 33.7	36.1	67 52.8	38.0
Mer. Pass.		h m 9 42.9	v 2.3	d 0.6	v 0.7	d 0.8	v 1.9	d 0.1	v 2.4	d 0.0

STARS

Name	S.H.A. ° ′	Dec. ° ′
Acamar	315 39.4	S40 23.9
Achernar	335 47.6	S57 21.1
Acrux	173 39.1	S62 58.6
Adhara	255 34.1	S28 56.8
Aldebaran	291 20.9	N16 27.7
Alioth	166 44.1	N56 05.0
Alkaid	153 19.9	N49 25.6
Al Na'ir	28 18.1	S47 04.0
Alnilam	276 14.2	S 1 13.2
Alphard	218 22.7	S 8 33.9
Alphecca	126 33.7	N26 47.4
Alpheratz	358 12.0	N28 57.8
Altair	62 34.7	N 8 48.4
Ankaa	353 42.9	S42 25.7
Antares	112 59.4	S26 22.9
Arcturus	146 20.2	N19 17.9
Atria	108 25.2	S68 59.0
Avior	234 29.1	S59 26.6
Bellatrix	279 01.5	N 6 19.6
Betelgeuse	271 31.0	N 7 24.0
Canopus	264 08.5	S52 41.4
Capella	281 15.0	N45 58.5
Deneb	49 50.0	N45 11.8
Denebola	183 01.2	N14 41.8
Diphda	349 23.5	S18 06.7
Dubhe	194 24.6	N61 52.5
Elnath	278 47.3	N28 35.3
Eltanin	90 58.5	N51 29.3
Enif	34 13.9	N 9 46.2
Fomalhaut	15 54.2	S29 44.5
Gacrux	172 30.7	S56 59.4
Gienah	176 20.0	S17 25.2
Hadar	149 25.9	S60 15.9
Hamal	328 31.8	N23 21.2
Kaus Aust.	84 19.7	S34 23.6
Kochab	137 17.9	N74 14.9
Markab	14 05.6	N15 04.9
Menkar	314 43.9	N 3 59.9
Menkent	148 39.3	S36 15.6
Miaplacidus	221 45.2	S69 37.9
Mirfak	309 19.8	N49 46.8
Nunki	76 31.9	S26 19.4
Peacock	54 02.0	S56 48.2
Pollux	244 01.1	N28 04.8
Procyon	245 28.3	N 5 16.8
Rasalhague	96 31.5	N12 34.5
Regulus	208 12.3	N12 04.6
Rigel	281 38.5	S 8 13.9
Rigil Kent.	140 28.2	S60 44.5
Sabik	102 43.5	S15 41.8
Schedar	350 12.1	N56 24.6
Shaula	96 58.6	S37 05.1
Sirius	258 57.9	S16 41.4
Spica	158 59.6	S11 02.7
Suhail	223 12.4	S43 20.8
Vega	80 57.2	N38 45.6
Zuben'ubi	137 35.2	S15 56.9

	S.H.A. ° ′	Mer. Pass. h m
Venus	353 45.9	10 08
Mars	0 41.5	9 41
Jupiter	297 12.0	13 54
Saturn	227 07.5	18 33

	G.M.T.	SUN		MOON				
		G.H.A.	Dec.	G.H.A.	*v*	Dec.	*d*	H.P.
	d h	° ′	° ′	° ′	′	° ′	′	′
	25 00	180 29.6	N13 04.8	105 50.8	12.0	N17 14.7	4.0	54.8
	01	195 29.7	05.6	120 21.8	12.1	17 10.7	4.0	54.8
	02	210 29.8	06.4	134 52.9	12.1	17 06.7	4.2	54.9
	03	225 29.9	·· 07.2	149 24.0	12.0	17 02.5	4.2	54.9
	04	240 30.0	08.0	163 55.0	12.1	16 58.3	4.3	54.9
	05	255 30.2	08.8	178 26.1	12.0	16 54.0	4.4	54.9
	06	270 30.3	N13 09.7	192 57.1	12.1	N16 49.6	4.4	55.0
	07	285 30.4	10.5	207 28.2	12.1	16 45.2	4.6	55.0
	08	300 30.5	11.3	221 59.3	12.0	16 40.6	4.6	55.0
MONDAY	09	315 30.6	·· 12.1	236 30.3	12.1	16 36.0	4.7	55.0
	10	330 30.7	12.9	251 01.4	12.1	16 31.3	4.8	55.0
	11	345 30.8	13.7	265 32.5	12.0	16 26.5	4.9	55.1
	12	0 30.9	N13 14.5	280 03.5	12.1	N16 21.6	4.9	55.1
	13	15 31.0	15.4	294 34.6	12.0	16 16.7	5.1	55.1
	14	30 31.1	16.2	309 05.6	12.1	16 11.6	5.1	55.1
	15	45 31.2	·· 17.0	323 36.7	12.1	16 06.5	5.2	55.2
	16	60 31.3	17.8	338 07.8	12.0	16 01.3	5.3	55.2
	17	75 31.4	18.6	352 38.8	12.1	15 56.0	5.3	55.2
	18	90 31.6	N13 19.4	7 09.9	12.1	N15 50.7	5.5	55.2
	19	105 31.7	20.2	21 41.0	12.0	15 45.2	5.5	55.3
	20	120 31.8	21.0	36 12.0	12.1	15 39.7	5.6	55.3
	21	135 31.9	·· 21.8	50 43.1	12.1	15 34.1	5.7	55.3
	22	150 32.0	22.7	65 14.2	12.0	15 28.4	5.8	55.3
	23	165 32.1	23.5	79 45.2	12.1	15 22.6	5.8	55.4
	26 00	180 32.2	N13 24.3	94 16.3	12.1	N15 16.8	5.9	55.4
	01	195 32.3	25.1	108 47.4	12.0	15 10.9	6.0	55.4
	02	210 32.4	25.9	123 18.4	12.1	15 04.9	6.1	55.4
	03	225 32.5	·· 26.7	137 49.5	12.1	14 58.8	6.1	55.5
	04	240 32.6	27.5	152 20.6	12.0	14 52.7	6.3	55.5
	05	255 32.7	28.3	166 51.6	12.1	14 46.4	6.3	55.5
	06	270 32.8	N13 29.1	181 22.7	12.0	N14 40.1	6.4	55.6
	07	285 32.9	29.9	195 53.7	12.1	14 33.7	6.4	55.6
	08	300 33.0	30.7	210 24.8	12.1	14 27.3	6.6	55.6
TUESDAY	09	315 33.1	·· 31.5	224 55.9	12.0	14 20.7	6.6	55.6
	10	330 33.2	32.3	239 26.9	12.1	14 14.1	6.6	55.7
	11	345 33.3	33.1	253 58.0	12.0	14 07.5	6.8	55.7
	12	0 33.4	N13 33.9	268 29.0	12.0	N14 00.7	6.8	55.7
	13	15 33.5	34.8	283 00.0	12.1	13 53.9	7.0	55.8
	14	30 33.6	35.6	297 31.1	12.0	13 46.9	6.9	55.8
	15	45 33.7	·· 36.4	312 02.1	12.1	13 40.0	7.1	55.8
	16	60 33.8	37.2	326 33.2	12.0	13 32.9	7.1	55.9
	17	75 33.9	38.0	341 04.2	12.0	13 25.8	7.2	55.9
	18	90 34.0	N13 38.8	355 35.2	12.0	N13 18.6	7.3	55.9
	19	105 34.1	39.6	10 06.2	12.1	13 11.3	7.4	56.0
	20	120 34.2	40.4	24 37.3	12.0	13 03.9	7.4	56.0
	21	135 34.3	·· 41.2	39 08.3	12.0	12 56.5	7.5	56.0
	22	150 34.4	42.0	53 39.3	12.0	12 49.0	7.5	56.0
	23	165 34.5	42.8	68 10.3	12.0	12 41.5	7.7	56.1
	27 00	180 34.6	N13 43.6	82 41.3	12.0	N12 33.8	7.7	56.1
	01	195 34.7	44.4	97 12.3	12.0	12 26.1	7.8	56.1
	02	210 34.8	45.2	111 43.3	12.0	12 18.3	7.8	56.2
	03	225 34.9	·· 46.0	126 14.3	11.9	12 10.5	7.9	56.2
	04	240 35.0	46.8	140 45.2	12.0	12 02.6	8.0	56.2
	05	255 35.1	47.6	155 16.2	11.9	11 54.6	8.0	56.3
	06	270 35.2	N13 48.4	169 47.1	12.0	N11 46.6	8.2	56.3
	07	285 35.3	49.1	184 18.1	11.9	11 38.4	8.1	56.3
	08	300 35.4	49.9	198 49.0	12.0	11 30.3	8.3	56.4
	09	315 35.5	·· 50.7	213 20.0	11.9	11 22.0	8.3	56.4
	10	330 35.6	51.5	227 50.9	11.9	11 13.7	8.4	56.5
WEDNESDAY	11	345 35.7	52.3	242 21.8	11.9	11 05.3	8.4	56.5
	12	0 35.8	N13 53.1	256 52.7	11.9	N10 56.9	8.6	56.5
	13	15 35.9	53.9	271 23.6	11.9	10 48.3	8.5	56.6
	14	30 36.0	54.7	285 54.5	11.9	10 39.8	8.7	56.6
	15	45 36.1	·· 55.5	300 25.4	11.8	10 31.1	8.7	56.6
	16	60 36.2	56.3	314 56.2	11.9	10 22.4	8.8	56.7
	17	75 36.3	57.1	329 27.1	11.8	10 13.6	8.8	56.7
	18	90 36.4	N13 57.9	343 57.9	11.8	N10 04.8	8.9	56.7
	19	105 36.5	58.7	358 28.7	11.8	9 55.9	8.9	56.8
	20	120 36.6	13 59.5	12 59.5	11.8	9 47.0	9.0	56.8
	21	135 36.7	14 00.3	27 30.3	11.8	9 38.0	9.1	56.8
	22	150 36.8	01.1	42 01.1	11.8	9 28.9	9.2	56.9
	23	165 36.9	01.8	56 31.9	11.7	9 19.7	9.2	56.9
		S.D. 15.9	*d* 0.8	S.D. 15.0		15.2		15.4

Lat.	Twilight		Sunrise	Moonrise			
	Naut.	Civil		25	26	27	28
°	h m	h m	h m	h m	h m	h m	h m
N 72	////	////	02 31	06 41	08 33	10 21	12 09
N 70	////	00 55	03 00	07 31	09 04	10 41	12 20
68	////	01 52	03 21	08 02	09 26	10 56	12 29
66	////	02 25	03 38	08 26	09 44	11 08	12 36
64	00 48	02 49	03 51	08 44	09 58	11 18	12 42
62	01 39	03 07	04 03	08 59	10 10	11 27	12 48
60	02 09	03 22	04 12	09 11	10 20	11 34	12 52
N 58	02 31	03 34	04 21	09 22	10 29	11 40	12 56
56	02 48	03 45	04 28	09 31	10 36	11 46	13 00
54	03 02	03 55	04 35	09 39	10 43	11 51	13 03
52	03 15	04 03	04 41	09 47	10 49	11 56	13 06
50	03 25	04 10	04 46	09 54	10 55	12 00	13 08
45	03 47	04 26	04 57	10 08	11 07	12 09	13 14
N 40	04 03	04 38	05 07	10 20	11 17	12 16	13 19
35	04 16	04 48	05 15	10 30	11 25	12 23	13 23
30	04 27	04 57	05 22	10 38	11 32	12 28	13 26
20	04 44	05 11	05 34	10 53	11 45	12 38	13 33
N 10	04 58	05 23	05 45	11 07	11 56	12 47	13 38
0	05 08	05 33	05 54	11 19	12 07	12 55	13 43
S 10	05 18	05 42	06 04	11 31	12 17	13 03	13 48
20	05 26	05 52	06 14	11 44	12 28	13 11	13 54
30	05 33	06 01	06 26	11 59	12 41	13 21	14 00
35	05 36	06 06	06 32	12 08	12 48	13 26	14 04
40	05 40	06 12	06 40	12 18	12 56	13 33	14 08
45	05 43	06 18	06 48	12 29	13 06	13 40	14 12
S 50	05 47	06 25	06 59	12 43	13 18	13 49	14 18
52	05 49	06 28	07 04	12 50	13 23	13 53	14 20
54	05 50	06 32	07 09	12 57	13 29	13 57	14 23
56	05 52	06 35	07 15	13 05	13 36	14 02	14 26
58	05 53	06 40	07 21	13 14	13 43	14 08	14 30
S 60	05 55	06 44	07 29	13 25	13 51	14 14	14 33

Lat.	Sunset	Twilight		Moonset			
		Civil	Naut.	25	26	27	28
°	h m	h m	h m	h m	h m	h m	h m
N 72	21 30	////	////	03 41	03 28	03 19	03 12
N 70	21 00	23 18	////	02 50	02 56	02 59	03 00
68	20 38	22 10	////	02 18	02 33	02 43	02 49
66	20 20	21 35	////	01 54	02 15	02 29	02 41
64	20 07	21 10	23 23	01 35	02 00	02 18	02 33
62	19 55	20 51	22 22	01 20	01 47	02 09	02 27
60	19 45	20 36	21 51	01 07	01 37	02 01	02 22
N 58	19 36	20 23	21 28	00 56	01 27	01 54	02 17
56	19 29	20 12	21 10	00 47	01 19	01 47	02 12
54	19 22	20 02	20 55	00 38	01 12	01 42	02 09
52	19 16	19 54	20 43	00 30	01 05	01 37	02 05
50	19 11	19 47	20 32	00 23	01 00	01 32	02 02
45	18 59	19 31	20 10	00 09	00 47	01 22	01 55
N 40	18 49	19 18	19 53	24 36	00 36	01 14	01 49
35	18 41	19 08	19 40	24 27	00 27	01 06	01 44
30	18 34	18 59	19 29	24 19	00 19	01 00	01 39
20	18 22	18 45	19 11	24 05	00 05	00 49	01 31
N 10	18 11	18 33	18 58	23 53	24 39	00 39	01 24
0	18 01	18 22	18 47	23 42	24 30	00 30	01 18
S 10	17 51	18 13	18 38	23 30	24 20	00 20	01 11
20	17 41	18 04	18 30	23 18	24 11	00 11	01 04
30	17 30	17 54	18 22	23 04	23 59	24 56	00 56
35	17 23	17 49	18 19	22 56	23 52	24 51	00 51
40	17 15	17 43	18 15	22 47	23 45	24 46	00 46
45	17 07	17 37	18 11	22 36	23 36	24 40	00 40
S 50	16 56	17 30	18 08	22 22	23 25	24 32	00 32
52	16 51	17 27	18 06	22 16	23 20	24 29	00 29
54	16 46	17 23	18 05	22 09	23 15	24 25	00 25
56	16 40	17 19	18 03	22 01	23 09	24 20	00 20
58	16 33	17 15	18 01	21 53	23 02	24 16	00 16
S 60	16 26	17 10	17 59	21 43	22 54	24 10	00 10

Day	SUN			MOON			
	Eqn. of Time		Mer. Pass.	Mer. Pass.		Age	Phase
	00ʰ	12ʰ		Upper	Lower		
	m s	m s	h m	h m	h m	d	
25	01 58	02 03	11 58	17 30	05 06	07	◐
26	02 09	02 14	11 58	18 18	05 54	08	
27	02 18	02 23	11 58	19 06	06 42	09	

1977 APRIL 28, 29, 30 (THURS., FRI., SAT.)

	G.M.T.	ARIES G.H.A.	VENUS −4.1 G.H.A.	VENUS Dec.	MARS +1.3 G.H.A.	MARS Dec.	JUPITER −1.5 G.H.A.	JUPITER Dec.	SATURN +0.5 G.H.A.	SATURN Dec.
	d h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
	28 00	215 51.1	209 28.0	N 6 02.5	215 07.6	S 1 00.4	152 35.6	N20 36.2	82 55.2	N18 38.0
	01	230 53.6	224 30.2	02.0	230 08.3	0 59.6	167 37.4	36.3	97 57.6	38.0
	02	245 56.1	239 32.4	01.5	245 09.0	58.9	182 39.3	36.4	113 00.0	38.0
	03	260 58.5	254 34.6	·· 01.0	260 09.7	·· 58.1	197 41.2	·· 36.5	128 02.4	·· 38.0
	04	276 01.0	269 36.7	00.5	275 10.4	57.3	212 43.1	36.6	143 04.7	37.9
	05	291 03.5	284 38.9	6 00.1	290 11.1	56.6	227 45.0	36.7	158 07.1	37.9
	06	306 05.9	299 41.1	N 5 59.6	305 11.8	S 0 55.8	242 46.9	N20 36.8	173 09.5	N18 37.9
	07	321 08.4	314 43.2	59.1	320 12.5	55.0	257 48.8	36.9	188 11.9	37.9
T	08	336 10.9	329 45.4	58.6	335 13.2	54.2	272 50.6	37.0	203 14.3	37.9
H	09	351 13.3	344 47.6	·· 58.1	350 13.9	·· 53.5	287 52.5	·· 37.1	218 16.7	·· 37.8
U	10	6 15.8	359 49.7	57.7	5 14.6	52.7	302 54.4	37.2	233 19.1	37.8
R	11	21 18.2	14 51.9	57.2	20 15.3	51.9	317 56.3	37.3	248 21.5	37.8
S	12	36 20.7	29 54.0	N 5 56.7	35 16.0	S 0 51.2	332 58.2	N20 37.4	263 23.8	N18 37.8
D	13	51 23.2	44 56.1	56.3	50 16.7	50.4	348 00.1	37.5	278 26.2	37.8
A	14	66 25.6	59 58.3	55.8	65 17.4	49.6	3 02.0	37.6	293 28.6	37.7
Y	15	81 28.1	75 00.4	·· 55.3	80 18.1	·· 48.8	18 03.8	·· 37.7	308 31.0	·· 37.7
	16	96 30.6	90 02.6	54.9	95 18.8	48.1	33 05.7	37.8	323 33.4	37.7
	17	111 33.0	105 04.7	54.4	110 19.4	47.3	48 07.6	37.9	338 35.8	37.7
	18	126 35.5	120 06.8	N 5 53.9	125 20.1	S 0 46.5	63 09.5	N20 38.1	353 38.1	N18 37.6
	19	141 38.0	135 08.9	53.5	140 20.8	45.8	78 11.4	38.2	8 40.5	37.6
	20	156 40.4	150 11.1	53.0	155 21.5	45.0	93 13.3	38.3	23 42.9	37.6
	21	171 42.9	165 13.2	·· 52.6	170 22.2	·· 44.2	108 15.1	·· 38.4	38 45.3	·· 37.6
	22	186 45.3	180 15.3	52.1	185 22.9	43.4	123 17.0	38.5	53 47.7	37.6
	23	201 47.8	195 17.4	51.7	200 23.6	42.7	138 18.9	38.6	68 50.1	37.5
	29 00	216 50.3	210 19.5	N 5 51.2	215 24.3	S 0 41.9	153 20.8	N20 38.7	83 52.5	N18 37.5
	01	231 52.7	225 21.6	50.8	230 25.0	41.1	168 22.7	38.8	98 54.8	37.5
	02	246 55.2	240 23.7	50.3	245 25.7	40.4	183 24.6	38.9	113 57.2	37.5
	03	261 57.7	255 25.8	·· 49.9	260 26.4	·· 39.6	198 26.5	·· 39.0	128 59.6	·· 37.4
	04	277 00.1	270 27.9	49.5	275 27.1	38.8	213 28.3	39.1	144 02.0	37.4
	05	292 02.6	285 30.0	49.0	290 27.8	38.0	228 30.2	39.2	159 04.4	37.4
	06	307 05.1	300 32.0	N 5 48.6	305 28.5	S 0 37.3	243 32.1	N20 39.3	174 06.8	N18 37.4
	07	322 07.5	315 34.1	48.1	320 29.2	36.5	258 34.0	39.4	189 09.1	37.4
	08	337 10.0	330 36.2	47.7	335 29.9	35.7	273 35.9	39.5	204 11.5	37.3
F	09	352 12.5	345 38.3	·· 47.3	350 30.6	·· 35.0	288 37.8	·· 39.6	219 13.9	·· 37.3
R	10	7 14.9	0 40.3	46.9	5 31.3	34.2	303 39.6	39.7	234 16.3	37.3
I	11	22 17.4	15 42.4	46.4	20 32.0	33.4	318 41.5	39.8	249 18.7	37.3
D	12	37 19.8	30 44.5	N 5 46.0	35 32.7	S 0 32.7	333 43.4	N20 39.9	264 21.0	N18 37.2
A	13	52 22.3	45 46.5	45.6	50 33.4	31.9	348 45.3	40.0	279 23.4	37.2
Y	14	67 24.8	60 48.6	45.2	65 34.1	31.1	3 47.2	40.1	294 25.8	37.2
	15	82 27.2	75 50.6	·· 44.7	80 34.8	·· 30.3	18 49.1	·· 40.2	309 28.2	·· 37.2
	16	97 29.7	90 52.7	44.3	95 35.5	29.6	33 50.9	40.3	324 30.6	37.1
	17	112 32.2	105 54.7	43.9	110 36.2	28.8	48 52.8	40.4	339 33.0	37.1
	18	127 34.6	120 56.8	N 5 43.5	125 36.9	S 0 28.0	63 54.7	N20 40.5	354 35.3	N18 37.1
	19	142 37.1	135 58.8	43.1	140 37.6	27.3	78 56.6	40.6	9 37.7	37.1
	20	157 39.6	151 00.8	42.7	155 38.3	26.5	93 58.5	40.7	24 40.1	37.1
	21	172 42.0	166 02.9	·· 42.3	170 39.0	·· 25.7	109 00.4	·· 40.8	39 42.5	·· 37.0
	22	187 44.5	181 04.9	41.9	185 39.6	24.9	124 02.2	40.9	54 44.9	37.0
	23	202 47.0	196 06.9	41.5	200 40.3	24.2	139 04.1	41.0	69 47.2	37.0
	30 00	217 49.4	211 08.9	N 5 41.1	215 41.0	S 0 23.4	154 06.0	N20 41.1	84 49.6	N18 37.0
	01	232 51.9	226 11.0	40.7	230 41.7	22.6	169 07.9	41.2	99 52.0	36.9
	02	247 54.3	241 13.0	40.3	245 42.4	21.9	184 09.8	41.3	114 54.4	36.9
	03	262 56.8	256 15.0	·· 39.9	260 43.1	·· 21.1	199 11.6	·· 41.5	129 56.8	·· 36.9
	04	277 59.3	271 17.0	39.5	275 43.8	20.3	214 13.5	41.6	144 59.1	36.9
	05	293 01.7	286 19.0	39.1	290 44.5	19.6	229 15.4	41.7	160 01.5	36.8
	06	308 04.2	301 21.0	N 5 38.7	305 45.2	S 0 18.8	244 17.3	N20 41.8	175 03.9	N18 36.8
	07	323 06.7	316 23.0	38.3	320 45.9	18.0	259 19.2	41.9	190 06.3	36.8
S	08	338 09.1	331 25.0	37.9	335 46.6	17.2	274 21.1	42.0	205 08.6	36.8
A	09	353 11.6	346 27.0	·· 37.5	350 47.3	·· 16.5	289 22.9	·· 42.1	220 11.0	·· 36.7
T	10	8 14.1	1 29.0	37.2	5 48.0	15.7	304 24.8	42.2	235 13.4	36.7
U	11	23 16.5	16 30.9	36.8	20 48.7	14.9	319 26.7	42.3	250 15.8	36.7
R	12	38 19.0	31 32.9	N 5 36.4	35 49.4	S 0 14.2	334 28.6	N20 42.4	265 18.2	N18 36.7
D	13	53 21.4	46 34.9	36.0	50 50.1	13.4	349 30.5	42.5	280 20.5	36.7
A	14	68 23.9	61 36.9	35.6	65 50.8	12.6	4 32.3	42.6	295 22.9	36.6
Y	15	83 26.4	76 38.8	·· 35.3	80 51.5	·· 11.9	19 34.2	·· 42.7	310 25.3	·· 36.6
	16	98 28.8	91 40.8	34.9	95 52.2	11.1	34 36.1	42.8	325 27.7	36.6
	17	113 31.3	106 42.8	34.5	110 52.9	10.3	49 38.0	42.9	340 30.0	36.6
	18	128 33.8	121 44.7	N 5 34.2	125 53.6	S 0 09.5	64 39.9	N20 43.0	355 32.4	N18 36.5
	19	143 36.2	136 46.7	33.8	140 54.3	08.8	79 41.7	43.1	10 34.8	36.5
	20	158 38.7	151 48.6	33.4	155 55.0	08.0	94 43.6	43.2	25 37.2	36.5
	21	173 41.2	166 50.6	·· 33.1	170 55.7	·· 07.2	109 45.5	·· 43.3	40 39.5	·· 36.5
	22	188 43.6	181 52.5	32.7	185 56.4	06.5	124 47.4	43.4	55 41.9	36.4
	23	203 46.1	196 54.5	32.4	200 57.1	05.7	139 49.3	43.5	70 44.3	36.4
	Mer. Pass.	h m 9 31.1	*v* 2.1	*d* 0.4	*v* 0.7	*d* 0.8	*v* 1.9	*d* 0.1	*v* 2.4	*d* 0.0

STARS

Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 39.4	S40 23.9
Achernar	335 47.6	S57 21.1
Acrux	173 39.1	S62 58.7
Adhara	255 34.1	S28 56.8
Aldebaran	291 20.9	N16 27.7
Alioth	166 44.1	N56 05.0
Alkaid	153 19.9	N49 25.6
Al Na'ir	28 18.0	S47 04.0
Alnilam	276 14.2	S 1 13.2
Alphard	218 22.8	S 8 33.9
Alphecca	126 33.7	N26 47.4
Alpheratz	358 11.9	N28 57.8
Altair	62 34.7	N 8 48.4
Ankaa	353 42.9	S42 25.7
Antares	112 59.3	S26 22.9
Arcturus	146 20.2	N19 18.0
Atria	108 25.2	S68 59.1
Avior	234 29.1	S59 26.6
Bellatrix	279 01.5	N 6 19.6
Betelgeuse	271 31.0	N 7 24.0
Canopus	264 08.5	S52 41.4
Capella	281 15.0	N45 58.5
Deneb	49 50.0	N45 11.8
Denebola	183 01.2	N14 41.8
Diphda	349 23.5	S18 06.7
Dubhe	194 24.7	N61 52.5
Elnath	278 47.3	N28 35.3
Eltanin	90 58.4	N51 29.3
Enif	34 13.9	N 9 46.2
Fomalhaut	15 54.2	S29 44.4
Gacrux	172 30.7	S56 59.4
Gienah	176 20.0	S17 25.2
Hadar	149 25.9	S60 15.9
Hamal	328 31.8	N23 21.2
Kaus Aust.	84 19.7	S34 23.6
Kochab	137 17.8	N74 14.9
Markab	14 05.6	N15 04.9
Menkar	314 43.9	N 3 59.9
Menkent	148 39.3	S36 15.6
Miaplacidus	221 45.2	S69 37.9
Mirfak	309 19.8	N49 46.8
Nunki	76 31.9	S26 19.4
Peacock	54 02.0	S56 48.2
Pollux	244 01.1	N28 04.8
Procyon	245 28.3	N 5 16.8
Rasalhague	96 31.5	N12 34.5
Regulus	208 12.3	N12 04.6
Rigel	281 38.5	S 8 13.9
Rigil Kent.	140 28.2	S60 44.5
Sabik	102 43.5	S15 41.8
Schedar	350 12.0	N56 24.6
Shaula	96 58.6	S37 05.1
Sirius	258 57.9	S16 41.4
Spica	158 59.6	S11 02.7
Suhail	223 12.4	S43 20.8
Vega	80 57.2	N38 45.6
Zuben'ubi	137 35.2	S15 56.9

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	353 29.2	9 57
Mars	358 34.0	9 38
Jupiter	296 30.5	13 45
Saturn	227 02.2	18 22

	G.M.T.	SUN G.H.A.	SUN Dec.	MOON G.H.A.	MOON *v*	MOON Dec.	MOON *d*	MOON H.P.
	d h	° ′	° ′	° ′	′	° ′	′	′
	28 00	180 37.0	N14 02.6	71 02.6	11.8	N 9 10.5	9.2	57.0
	01	195 37.1	03.4	85 33.4	11.7	9 01.3	9.3	57.0
	02	210 37.2	04.2	100 04.1	11.7	8 52.0	9.4	57.0
	03	225 37.3	·· 05.0	114 34.8	11.7	8 42.6	9.4	57.1
	04	240 37.4	05.8	129 05.5	11.7	8 33.2	9.5	57.1
	05	255 37.5	06.6	143 36.2	11.6	8 23.7	9.5	57.1
	06	270 37.6	N14 07.4	158 06.8	11.7	N 8 14.2	9.6	57.2
	07	285 37.7	08.1	172 37.5	11.6	8 04.6	9.7	57.2
T	08	300 37.7	08.9	187 08.1	11.6	7 54.9	9.7	57.3
H	09	315 37.8	·· 09.7	201 38.7	11.5	7 45.2	9.7	57.3
U	10	330 37.9	10.5	216 09.2	11.6	7 35.5	9.8	57.3
R	11	345 38.0	11.3	230 39.8	11.5	7 25.7	9.9	57.4
S	12	0 38.1	N14 12.1	245 10.3	11.5	N 7 15.8	9.9	57.4
D	13	15 38.2	12.9	259 40.8	11.5	7 05.9	10.0	57.5
A	14	30 38.3	13.6	274 11.3	11.5	6 55.9	10.0	57.5
Y	15	45 38.4	·· 14.4	288 41.8	11.4	6 45.9	10.0	57.5
	16	60 38.5	15.2	303 12.2	11.4	6 35.9	10.1	57.6
	17	75 38.6	16.0	317 42.6	11.4	6 25.8	10.2	57.6
	18	90 38.7	N14 16.8	332 13.0	11.4	N 6 15.6	10.2	57.7
	19	105 38.8	17.6	346 43.4	11.3	6 05.4	10.2	57.7
	20	120 38.9	18.3	1 13.7	11.4	5 55.2	10.3	57.7
	21	135 38.9	·· 19.1	15 44.1	11.3	5 44.9	10.4	57.8
	22	150 39.0	19.9	30 14.4	11.2	5 34.5	10.4	57.8
	23	165 39.1	20.7	44 44.6	11.2	5 24.1	10.4	57.9
	29 00	180 39.2	N14 21.5	59 14.8	11.3	N 5 13.7	10.5	57.9
	01	195 39.3	22.2	73 45.1	11.1	5 03.2	10.5	57.9
	02	210 39.4	23.0	88 15.2	11.2	4 52.7	10.5	58.0
	03	225 39.5	·· 23.8	102 45.4	11.1	4 42.2	10.6	58.0
	04	240 39.6	24.6	117 15.5	11.1	4 31.6	10.7	58.1
	05	255 39.7	25.4	131 45.6	11.0	4 20.9	10.6	58.1
	06	270 39.7	N14 26.1	146 15.6	11.0	N 4 10.3	10.7	58.1
	07	285 39.8	26.9	160 45.6	11.0	3 59.6	10.8	58.2
	08	300 39.9	27.7	175 15.6	11.0	3 48.8	10.8	58.2
F	09	315 40.0	·· 28.5	189 45.6	10.9	3 38.0	10.8	58.3
R	10	330 40.1	29.2	204 15.5	10.9	3 27.2	10.8	58.3
I	11	345 40.2	30.0	218 45.4	10.8	3 16.4	10.9	58.3
D	12	0 40.3	N14 30.8	233 15.2	10.8	N 3 05.5	10.9	58.4
A	13	15 40.4	31.6	247 45.0	10.8	2 54.6	11.0	58.4
Y	14	30 40.4	32.3	262 14.8	10.8	2 43.6	11.0	58.5
	15	45 40.5	·· 33.1	276 44.6	10.7	2 32.6	11.0	58.5
	16	60 40.6	33.9	291 14.3	10.6	2 21.6	11.0	58.5
	17	75 40.7	34.7	305 43.9	10.6	2 10.6	11.1	58.6
	18	90 40.8	N14 35.4	320 13.5	10.6	N 1 59.5	11.1	58.6
	19	105 40.9	36.2	334 43.1	10.6	1 48.4	11.1	58.7
	20	120 41.0	37.0	349 12.7	10.5	1 37.3	11.1	58.7
	21	135 41.1	·· 37.8	3 42.2	10.4	1 26.2	11.2	58.7
	22	150 41.1	38.5	18 11.6	10.4	1 15.0	11.2	58.8
	23	165 41.2	39.3	32 41.0	10.4	1 03.8	11.2	58.8
	30 00	180 41.3	N14 40.1	47 10.4	10.3	N 0 52.6	11.2	58.9
	01	195 41.4	40.8	61 39.7	10.3	0 41.4	11.3	58.9
	02	210 41.5	41.6	76 09.0	10.3	0 30.1	11.3	58.9
	03	225 41.6	·· 42.4	90 38.3	10.2	0 18.8	11.3	59.0
	04	240 41.6	43.1	105 07.5	10.1	N 0 07.5	11.3	59.0
	05	255 41.7	43.9	119 36.6	10.1	S 0 03.8	11.3	59.1
	06	270 41.8	N14 44.7	134 05.7	10.1	S 0 15.1	11.3	59.1
	07	285 41.9	45.4	148 34.8	10.0	0 26.4	11.4	59.1
S	08	300 42.0	46.2	163 03.8	9.9	0 37.8	11.3	59.2
A	09	315 42.1	·· 47.0	177 32.7	9.9	0 49.1	11.4	59.2
T	10	330 42.1	47.7	192 01.6	9.9	1 00.5	11.4	59.2
U	11	345 42.2	48.5	206 30.5	9.8	1 11.9	11.4	59.3
R	12	0 42.3	N14 49.3	220 59.3	9.8	S 1 23.3	11.4	59.3
D	13	15 42.4	50.0	235 28.1	9.7	1 34.7	11.4	59.4
A	14	30 42.5	50.8	249 56.8	9.6	1 46.1	11.4	59.4
Y	15	45 42.5	·· 51.6	264 25.4	9.6	1 57.5	11.4	59.4
	16	60 42.6	52.3	278 54.0	9.6	2 08.9	11.4	59.5
	17	75 42.7	53.1	293 22.6	9.5	2 20.3	11.5	59.5
	18	90 42.8	N14 53.9	307 51.1	9.4	S 2 31.8	11.4	59.5
	19	105 42.9	54.6	322 19.5	9.4	2 43.2	11.4	59.6
	20	120 43.0	55.4	336 47.9	9.3	2 54.6	11.4	59.6
	21	135 43.0	·· 56.1	351 16.2	9.3	3 06.0	11.4	59.7
	22	150 43.1	56.9	5 44.5	9.2	3 17.4	11.4	59.7
	23	165 43.2	57.7	20 12.7	9.2	3 28.8	11.4	59.7
		S.D. 15.9	*d* 0.8	S.D. 15.6		15.9		16.2

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 28	Moonrise 29	Moonrise 30	Moonrise 1
°	h m	h m	h m	h m	h m	h m	h m
N 72	////	////	02 10	12 09	13 59	15 52	17 51
N 70	////	////	02 43	12 20	14 03	15 49	17 40
68	////	01 28	03 07	12 29	14 06	15 46	17 31
66	////	02 08	03 26	12 36	14 08	15 44	17 24
64	////	02 35	03 41	12 42	14 11	15 42	17 18
62	01 18	02 56	03 53	12 48	14 12	15 41	17 13
60	01 54	03 12	04 04	12 52	14 14	15 39	17 08
N 58	02 19	03 26	04 13	12 56	14 15	15 38	17 04
56	02 38	03 37	04 21	13 00	14 17	15 37	17 00
54	02 54	03 47	04 28	13 03	14 18	15 36	16 57
52	03 07	03 56	04 35	13 06	14 19	15 35	16 54
50	03 18	04 04	04 40	13 08	14 20	15 34	16 52
45	03 41	04 21	04 53	13 14	14 22	15 33	16 46
N 40	03 58	04 34	05 03	13 19	14 24	15 31	16 41
35	04 12	04 45	05 12	13 23	14 25	15 30	16 37
30	04 24	04 54	05 19	13 26	14 26	15 29	16 34
20	04 42	05 09	05 32	13 33	14 29	15 27	16 27
N 10	04 56	05 22	05 43	13 38	14 31	15 25	16 22
0	05 08	05 33	05 54	13 43	14 33	15 24	16 17
S 10	05 18	05 43	06 04	13 48	14 35	15 22	16 12
20	05 26	05 52	06 15	13 54	14 37	15 21	16 07
30	05 35	06 03	06 28	14 00	14 39	15 19	16 01
35	05 39	06 08	06 35	14 04	14 40	15 18	15 58
40	05 43	06 15	06 43	14 08	14 42	15 17	15 54
45	05 47	06 21	06 52	14 12	14 44	15 16	15 50
S 50	05 51	06 29	07 03	14 18	14 46	15 14	15 44
52	05 53	06 33	07 08	14 20	14 47	15 14	15 42
54	05 55	06 37	07 14	14 23	14 48	15 13	15 39
56	05 57	06 41	07 21	14 26	14 49	15 12	15 37
58	05 59	06 45	07 28	14 30	14 50	15 11	15 33
S 60	06 01	06 51	07 36	14 33	14 52	15 10	15 30

Lat.	Sunset	Twilight Civil	Twilight Naut.	Moonset 28	Moonset 29	Moonset 30	Moonset 1
°	h m	h m	h m	h m	h m	h m	h m
N 72	21 51	////	////	03 12	03 06	02 59	02 53
N 70	21 16	////	////	03 00	03 00	02 59	02 59
68	20 51	22 34	////	02 49	02 54	02 59	03 04
66	20 31	21 51	////	02 41	02 50	02 59	03 08
64	20 16	21 23	////	02 33	02 46	02 59	03 11
62	20 03	21 02	22 44	02 27	02 43	02 59	03 14
60	19 52	20 45	22 05	02 22	02 40	02 58	03 17
N 58	19 43	20 31	21 39	02 17	02 38	02 58	03 19
56	19 35	20 19	21 19	02 12	02 36	02 58	03 22
54	19 28	20 09	21 03	02 09	02 34	02 58	03 24
52	19 21	20 00	20 50	02 05	02 32	02 58	03 25
50	19 15	19 52	20 38	02 02	02 30	02 58	03 27
45	19 03	19 35	20 15	01 55	02 26	02 58	03 30
N 40	18 52	19 22	19 57	01 49	02 23	02 58	03 33
35	18 44	19 11	19 43	01 44	02 21	02 58	03 36
30	18 36	19 01	19 31	01 39	02 18	02 57	03 38
20	18 23	18 46	19 13	01 31	02 14	02 57	03 42
N 10	18 11	18 33	18 59	01 24	02 10	02 57	03 46
0	18 01	18 22	18 47	01 18	02 07	02 57	03 49
S 10	17 50	18 12	18 37	01 11	02 03	02 56	03 52
20	17 39	18 02	18 28	01 04	01 59	02 56	03 55
30	17 27	17 51	18 20	00 56	01 55	02 56	03 59
35	17 20	17 46	18 16	00 51	01 52	02 56	04 02
40	17 11	17 40	18 11	00 46	01 49	02 55	04 04
45	17 02	17 33	18 07	00 40	01 46	02 55	04 07
S 50	16 51	17 25	18 03	00 32	01 42	02 55	04 11
52	16 45	17 21	18 01	00 29	01 40	02 55	04 12
54	16 40	17 17	17 59	00 25	01 38	02 54	04 14
56	16 33	17 13	17 57	00 20	01 36	02 54	04 16
58	16 26	17 08	17 55	00 16	01 33	02 54	04 18
S 60	16 18	17 03	17 52	00 10	01 30	02 54	04 21

Day	SUN Eqn. of Time 00ʰ	SUN Eqn. of Time 12ʰ	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	Age	Phase
	m s	m s	h m	h m	h m	d	
28	02 28	02 32	11 57	19 55	07 30	10	🌔
29	02 37	02 41	11 57	20 45	08 20	11	
30	02 45	02 49	11 57	21 36	09 10	12	

1977 MAY 1, 2, 3 (SUN., MON., TUES.)

G.M.T.		ARIES	VENUS −4.2		MARS +1.3		JUPITER −1.5		SATURN +0.5	
d	h	G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
		° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
1	00	218 48.6	211 56.4	N 5 32.0	215 57.8	S 0 04.9	154 51.1	N20 43.6	85 46.7	N18 36.4
	01	233 51.0	226 58.4	31.7	230 58.5	04.1	169 53.0	43.7	100 49.0	36.4
	02	248 53.5	242 00.3	31.3	245 59.2	03.4	184 54.9	43.8	115 51.4	36.3
	03	263 55.9	257 02.2	·· 30.9	260 59.9	·· 02.6	199 56.8	·· 43.9	130 53.8	·· 36.3
	04	278 58.4	272 04.1	30.6	276 00.6	01.8	214 58.7	44.0	145 56.2	36.3
	05	294 00.9	287 06.1	30.3	291 01.3	01.1	230 00.5	44.1	160 58.5	36.3
	06	309 03.3	302 08.0	N 5 29.9	306 02.0	S 0 00.3	245 02.4	N20 44.2	176 00.9	N18 36.2
	07	324 05.8	317 09.9	29.6	321 02.7	N 0 00.5	260 04.3	44.3	191 03.3	36.2
	08	339 08.3	332 11.8	29.2	336 03.4	01.2	275 06.2	44.4	206 05.7	36.2
S	09	354 10.7	347 13.7	·· 28.9	351 04.1	·· 02.0	290 08.1	·· 44.5	221 08.0	·· 36.2
U	10	9 13.2	2 15.6	28.6	6 04.8	02.8	305 09.9	44.6	236 10.4	36.1
N	11	24 15.7	17 17.5	28.2	21 05.5	03.5	320 11.8	44.7	251 12.8	36.1
D	12	39 18.1	32 19.4	N 5 27.9	36 06.2	N 0 04.3	335 13.7	N20 44.8	266 15.2	N18 36.1
A	13	54 20.6	47 21.3	27.6	51 06.9	05.1	350 15.6	44.9	281 17.5	36.1
Y	14	69 23.1	62 23.2	27.2	66 07.6	05.9	5 17.5	45.0	296 19.9	36.0
	15	84 25.5	77 25.1	·· 26.9	81 08.3	·· 06.6	20 19.3	·· 45.1	311 22.3	·· 36.0
	16	99 28.0	92 27.0	26.6	96 09.0	07.4	35 21.2	45.2	326 24.6	36.0
	17	114 30.4	107 28.9	26.2	111 09.7	08.2	50 23.1	45.3	341 27.0	36.0
	18	129 32.9	122 30.8	N 5 25.9	126 10.4	N 0 08.9	65 25.0	N20 45.4	356 29.4	N18 35.9
	19	144 35.4	137 32.6	25.6	141 11.1	09.7	80 26.9	45.5	11 31.8	35.9
	20	159 37.8	152 34.5	25.3	156 11.8	10.5	95 28.7	45.6	26 34.1	35.9
	21	174 40.3	167 36.4	·· 25.0	171 12.5	·· 11.2	110 30.6	·· 45.7	41 36.5	·· 35.9
	22	189 42.8	182 38.3	24.7	186 13.2	12.0	125 32.5	45.8	56 38.9	35.8
	23	204 45.2	197 40.1	24.3	201 13.9	12.8	140 34.4	45.9	71 41.3	35.8
2	00	219 47.7	212 42.0	N 5 24.0	216 14.6	N 0 13.6	155 36.2	N20 46.1	86 43.6	N18 35.8
	01	234 50.2	227 43.8	23.7	231 15.3	14.3	170 38.1	46.2	101 46.0	35.8
	02	249 52.6	242 45.7	23.4	246 16.0	15.1	185 40.0	46.3	116 48.4	35.7
	03	264 55.1	257 47.5	·· 23.1	261 16.7	·· 15.9	200 41.9	·· 46.4	131 50.7	·· 35.7
	04	279 57.5	272 49.4	22.8	276 17.4	16.6	215 43.8	46.5	146 53.1	35.7
	05	295 00.0	287 51.2	22.5	291 18.1	17.4	230 45.6	46.6	161 55.5	35.6
	06	310 02.5	302 53.1	N 5 22.2	306 18.8	N 0 18.2	245 47.5	N20 46.7	176 57.8	N18 35.6
	07	325 04.9	317 54.9	21.9	321 19.5	18.9	260 49.4	46.8	192 00.2	35.6
	08	340 07.4	332 56.8	21.6	336 20.2	19.7	275 51.3	46.9	207 02.6	35.6
M	09	355 09.9	347 58.6	·· 21.3	351 20.9	·· 20.5	290 53.1	·· 47.0	222 05.0	·· 35.5
O	10	10 12.3	3 00.4	21.0	6 21.6	21.2	305 55.0	47.1	237 07.3	35.5
N	11	25 14.8	18 02.2	20.7	21 22.3	22.0	320 56.9	47.2	252 09.7	35.5
D	12	40 17.3	33 04.1	N 5 20.5	36 23.0	N 0 22.8	335 58.8	N20 47.3	267 12.1	N18 35.5
A	13	55 19.7	48 05.9	20.2	51 23.7	23.5	351 00.6	47.4	282 14.4	35.4
Y	14	70 22.2	63 07.7	19.9	66 24.4	24.3	6 02.5	47.5	297 16.8	35.4
	15	85 24.7	78 09.5	·· 19.6	81 25.1	·· 25.1	21 04.4	·· 47.6	312 19.2	·· 35.4
	16	100 27.1	93 11.3	19.3	96 25.8	25.9	36 06.3	47.7	327 21.5	35.4
	17	115 29.6	108 13.1	19.0	111 26.5	26.6	51 08.2	47.8	342 23.9	35.3
	18	130 32.0	123 14.9	N 5 18.8	126 27.2	N 0 27.4	66 10.0	N20 47.9	357 26.3	N18 35.3
	19	145 34.5	138 16.7	18.5	141 27.9	28.2	81 11.9	48.0	12 28.6	35.3
	20	160 37.0	153 18.5	18.2	156 28.6	28.9	96 13.8	48.1	27 31.0	35.3
	21	175 39.4	168 20.3	·· 18.0	171 29.3	·· 29.7	111 15.7	·· 48.2	42 33.4	·· 35.2
	22	190 41.9	183 22.1	17.7	186 30.0	30.5	126 17.5	48.3	57 35.7	35.2
	23	205 44.4	198 23.9	17.4	201 30.7	31.2	141 19.4	48.4	72 38.1	35.2
3	00	220 46.8	213 25.7	N 5 17.1	216 31.4	N 0 32.0	156 21.3	N20 48.5	87 40.5	N18 35.1
	01	235 49.3	228 27.5	16.9	231 32.1	32.8	171 23.2	48.6	102 42.8	35.1
	02	250 51.8	243 29.2	16.6	246 32.8	33.5	186 25.0	48.7	117 45.2	35.1
	03	265 54.2	258 31.0	·· 16.4	261 33.5	·· 34.3	201 26.9	·· 48.8	132 47.6	·· 35.1
	04	280 56.7	273 32.8	16.1	276 34.2	35.1	216 28.8	48.9	147 49.9	35.0
	05	295 59.2	288 34.6	15.8	291 34.9	35.8	231 30.7	49.0	162 52.3	35.0
	06	311 01.6	303 36.3	N 5 15.6	306 35.6	N 0 36.6	246 32.5	N20 49.1	177 54.7	N18 35.0
	07	326 04.1	318 38.1	15.3	321 36.3	37.4	261 34.4	49.2	192 57.0	35.0
T	08	341 06.5	333 39.8	15.1	336 37.0	38.1	276 36.3	49.3	207 59.4	34.9
U	09	356 09.0	348 41.6	·· 14.8	351 37.7	·· 38.9	291 38.2	·· 49.4	223 01.8	·· 34.9
E	10	11 11.5	3 43.4	14.6	6 38.4	39.7	306 40.0	49.5	238 04.1	34.9
S	11	26 13.9	18 45.1	14.3	21 39.1	40.5	321 41.9	49.6	253 06.5	34.8
D	12	41 16.4	33 46.8	N 5 14.1	36 39.8	N 0 41.2	336 43.8	N20 49.7	268 08.9	N18 34.8
A	13	56 18.9	48 48.6	13.9	51 40.5	42.0	351 45.7	49.8	283 11.2	34.8
Y	14	71 21.3	63 50.3	13.6	66 41.2	42.8	6 47.5	49.9	298 13.6	34.8
	15	86 23.8	78 52.1	·· 13.4	81 41.9	·· 43.5	21 49.4	·· 50.0	313 15.9	·· 34.7
	16	101 26.3	93 53.8	13.1	96 42.6	44.3	36 51.3	50.1	328 18.3	34.7
	17	116 28.7	108 55.5	12.9	111 43.3	45.1	51 53.2	50.2	343 20.7	34.7
	18	131 31.2	123 57.3	N 5 12.7	126 44.0	N 0 45.8	66 55.0	N20 50.3	358 23.0	N18 34.7
	19	146 33.6	138 59.0	12.5	141 44.7	46.6	81 56.9	50.4	13 25.4	34.6
	20	161 36.1	154 00.7	12.2	156 45.4	47.4	96 58.8	50.5	28 27.8	34.6
	21	176 38.6	169 02.4	·· 12.0	171 46.1	·· 48.1	112 00.7	·· 50.6	43 30.1	·· 34.6
	22	191 41.0	184 04.1	11.8	186 46.8	48.9	127 02.5	50.7	58 32.5	34.5
	23	206 43.5	199 05.9	11.5	201 47.5	49.7	142 04.4	50.8	73 34.9	34.5
Mer. Pass.		h m 9 19.3	*v* 1.8	*d* 0.3	*v* 0.7	*d* 0.8	*v* 1.9	*d* 0.1	*v* 2.4	*d* 0.0

STARS		
Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 39.4	S40 23.8
Achernar	335 47.6	S57 21.1
Acrux	173 39.1	S62 58.7
Adhara	255 34.1	S28 56.8
Aldebaran	291 20.9	N16 27.7
Alioth	166 44.1	N56 05.0
Alkaid	153 19.9	N49 25.6
Al Na'ir	28 18.0	S47 04.0
Alnilam	276 14.2	S 1 13.2
Alphard	218 22.8	S 8 33.9
Alphecca	126 33.7	N26 47.4
Alpheratz	358 11.9	N28 57.8
Altair	62 34.7	N 8 48.4
Ankaa	353 42.9	S42 25.7
Antares	112 59.3	S26 22.9
Arcturus	146 20.2	N19 18.0
Atria	108 25.1	S68 59.1
Avior	234 29.2	S59 26.6
Bellatrix	279 01.5	N 6 19.6
Betelgeuse	271 31.0	N 7 24.0
Canopus	264 08.5	S52 41.4
Capella	281 15.1	N45 58.5
Deneb	49 50.0	N45 11.8
Denebola	183 01.2	N14 41.8
Diphda	349 23.5	S18 06.7
Dubhe	194 24.7	N61 52.5
Elnath	278 47.3	N28 35.2
Eltanin	90 58.4	N51 29.4
Enif	34 13.9	N 9 46.2
Fomalhaut	15 54.2	S29 44.4
Gacrux	172 30.7	S56 59.4
Gienah	176 20.1	S17 25.2
Hadar	149 25.9	S60 15.9
Hamal	328 31.8	N23 21.2
Kaus Aust.	84 19.6	S34 23.6
Kochab	137 17.8	N74 14.9
Markab	14 05.6	N15 04.9
Menkar	314 43.9	N 3 59.9
Menkent	148 39.3	S36 15.6
Miaplacidus	221 45.3	S69 37.9
Mirfak	309 19.8	N49 46.8
Nunki	76 31.8	S26 19.4
Peacock	54 02.0	S56 48.2
Pollux	244 01.1	N28 04.8
Procyon	245 28.3	N 5 16.8
Rasalhague	96 31.5	N12 34.5
Regulus	208 12.4	N12 04.6
Rigel	281 38.5	S 8 13.9
Rigil Kent.	140 28.2	S60 44.5
Sabik	102 43.5	S15 41.8
Schedar	350 12.0	N56 24.6
Shaula	96 58.5	S37 05.1
Sirius	258 57.9	S16 41.4
Spica	158 59.6	S11 02.7
Suhail	223 12.4	S43 20.8
Vega	80 57.1	N38 45.6
Zuben'ubi	137 35.2	S15 56.9

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	352 54.3	9 48
Mars	356 26.9	9 35
Jupiter	295 48.5	13 36
Saturn	226 55.9	18 10

G.M.T.	SUN		MOON				
	G.H.A.	Dec.	G.H.A.	v	Dec.	d	H.P.
d h	° ′	° ′	° ′	′	° ′	′	′
1 00	180 43.3	N14 58.4	34 40.9	9.1	S 3 40.2	11.4	59.8
01	195 43.3	59.2	49 09.0	9.0	3 51.6	11.4	59.8
02	210 43.4	14 59.9	63 37.0	9.0	4 03.0	11.4	59.8
03	225 43.5	15 00.7	78 05.0	8.9	4 14.4	11.4	59.9
04	240 43.6	01.5	92 32.9	8.9	4 25.8	11.3	59.9
05	255 43.7	02.2	107 00.8	8.8	4 37.1	11.3	59.9
06	270 43.7	N15 03.0	121 28.6	8.7	S 4 48.4	11.4	60.0
07	285 43.8	03.7	135 56.3	8.7	4 59.8	11.3	60.0
08	300 43.9	04.5	150 24.0	8.6	5 11.1	11.3	60.0
S 09	315 44.0	·· 05.2	164 51.6	8.6	5 22.4	11.2	60.1
U 10	330 44.0	06.0	179 19.2	8.5	5 33.6	11.3	60.1
N 11	345 44.1	06.7	193 46.7	8.4	5 44.9	11.2	60.1
D 12	0 44.2	N15 07.5	208 14.1	8.4	S 5 56.1	11.2	60.2
A 13	15 44.3	08.3	222 41.5	8.3	6 07.3	11.2	60.2
Y 14	30 44.4	09.0	237 08.8	8.3	6 18.5	11.1	60.2
15	45 44.4	·· 09.8	251 36.1	8.1	6 29.6	11.1	60.3
16	60 44.5	10.5	266 03.2	8.1	6 40.7	11.1	60.3
17	75 44.6	11.3	280 30.3	8.1	6 51.8	11.1	60.3
18	90 44.7	N15 12.0	294 57.4	8.0	S 7 02.9	11.0	60.4
19	105 44.7	12.8	309 24.4	7.9	7 13.9	11.0	60.4
20	120 44.8	13.5	323 51.3	7.9	7 24.9	10.9	60.4
21	135 44.9	·· 14.3	338 18.2	7.8	7 35.8	10.9	60.4
22	150 45.0	15.0	352 45.0	7.7	7 46.7	10.9	60.5
23	165 45.0	15.8	7 11.7	7.6	7 57.6	10.9	60.5
2 00	180 45.1	N15 16.5	21 38.3	7.6	S 8 08.5	10.7	60.5
01	195 45.2	17.3	36 04.9	7.5	8 19.2	10.8	60.6
02	210 45.2	18.0	50 31.4	7.5	8 30.0	10.7	60.6
03	225 45.3	·· 18.8	64 57.9	7.4	8 40.7	10.7	60.6
04	240 45.4	19.5	79 24.3	7.3	8 51.4	10.6	60.6
05	255 45.5	20.3	93 50.6	7.3	9 02.0	10.5	60.7
06	270 45.5	N15 21.0	108 16.9	7.2	S 9 12.5	10.5	60.7
07	285 45.6	21.8	122 43.1	7.1	9 23.0	10.5	60.7
08	300 45.7	22.5	137 09.2	7.0	9 33.5	10.4	60.7
M 09	315 45.8	·· 23.3	151 35.2	7.0	9 43.9	10.4	60.8
O 10	330 45.8	24.0	166 01.2	6.9	9 54.3	10.2	60.8
N 11	345 45.9	24.7	180 27.1	6.9	10 04.5	10.3	60.8
D 12	0 46.0	N15 25.5	194 53.0	6.8	S10 14.8	10.1	60.8
A 13	15 46.0	26.2	209 18.8	6.7	10 24.9	10.2	60.9
Y 14	30 46.1	27.0	223 44.5	6.6	10 35.1	10.0	60.9
15	45 46.2	·· 27.7	238 10.1	6.6	10 45.1	10.0	60.9
16	60 46.2	28.5	252 35.7	6.5	10 55.1	9.9	60.9
17	75 46.3	29.2	267 01.2	6.5	11 05.0	9.8	60.9
18	90 46.4	N15 29.9	281 26.7	6.4	S11 14.8	9.8	61.0
19	105 46.5	30.7	295 52.1	6.3	11 24.6	9.7	61.0
20	120 46.5	31.4	310 17.4	6.2	11 34.3	9.6	61.0
21	135 46.6	·· 32.2	324 42.6	6.2	11 43.9	9.6	61.0
22	150 46.7	32.9	339 07.8	6.2	11 53.5	9.5	61.0
23	165 46.7	33.6	353 33.0	6.0	12 03.0	9.4	61.0
3 00	180 46.8	N15 34.4	7 58.0	6.0	S12 12.4	9.3	61.1
01	195 46.9	35.1	22 23.0	5.9	12 21.7	9.3	61.1
02	210 46.9	35.9	36 47.9	5.9	12 31.0	9.1	61.1
03	225 47.0	·· 36.6	51 12.8	5.8	12 40.1	9.1	61.1
04	240 47.1	37.3	65 37.6	5.7	12 49.2	9.0	61.1
05	255 47.1	38.1	80 02.3	5.7	12 58.2	8.9	61.1
06	270 47.2	N15 38.8	94 27.0	5.6	S13 07.1	8.8	61.1
07	285 47.3	39.5	108 51.6	5.6	13 15.9	8.7	61.2
T 08	300 47.3	40.3	123 16.2	5.5	13 24.6	8.7	61.2
U 09	315 47.4	·· 41.0	137 40.7	5.4	13 33.3	8.5	61.2
E 10	330 47.5	41.7	152 05.1	5.4	13 41.8	8.5	61.2
S 11	345 47.5	42.5	166 29.5	5.3	13 50.3	8.3	61.2
D 12	0 47.6	N15 43.2	180 53.8	5.2	S13 58.6	8.3	61.2
A 13	15 47.7	43.9	195 18.0	5.2	14 06.9	8.2	61.2
Y 14	30 47.7	44.7	209 42.2	5.2	14 15.1	8.0	61.2
15	45 47.8	·· 45.4	224 06.4	5.1	14 23.1	8.0	61.2
16	60 47.9	46.1	238 30.5	5.0	14 31.1	7.8	61.2
17	75 47.9	46.9	252 54.5	5.0	14 38.9	7.8	61.3
18	90 48.0	N15 47.6	267 18.5	4.9	S14 46.7	7.7	61.3
19	105 48.0	48.3	281 42.4	4.9	14 54.4	7.5	61.3
20	120 48.1	49.1	296 06.3	4.8	15 01.9	7.4	61.3
21	135 48.2	·· 49.8	310 30.1	4.8	15 09.3	7.4	61.3
22	150 48.2	50.5	324 53.9	4.7	15 16.7	7.2	61.3
23	165 48.3	51.3	339 17.6	4.7	15 23.9	7.1	61.3
	S.D. 15.9	d 0.7	S.D. 16.4		16.6		16.7

Lat.	Twilight		Sunrise	Moonrise			
	Naut.	Civil		1	2	3	4
°	h m	h m	h m	h m	h m	h m	h m
N 72	////	////	01 45	17 51	19 58	22 15	■
N 70	////	////	02 26	17 40	19 36	21 36	23 33
68	////	00 57	02 53	17 31	19 20	21 10	22 53
66	////	01 50	03 14	17 24	19 07	20 49	22 25
64	////	02 21	03 31	17 18	18 56	20 33	22 04
62	00 50	02 44	03 44	17 13	18 47	20 20	21 47
60	01 38	03 02	03 56	17 08	18 39	20 09	21 33
N 58	02 06	03 17	04 06	17 04	18 32	19 59	21 21
56	02 28	03 30	04 14	17 00	18 26	19 50	21 11
54	02 45	03 40	04 22	16 57	18 20	19 43	21 01
52	02 59	03 50	04 29	16 54	18 15	19 36	20 53
50	03 11	03 58	04 35	16 52	18 11	19 30	20 46
45	03 36	04 16	04 48	16 46	18 01	19 17	20 30
N 40	03 54	04 30	04 59	16 41	17 53	19 06	20 17
35	04 09	04 41	05 08	16 37	17 46	18 57	20 06
30	04 21	04 51	05 16	16 34	17 41	18 49	19 57
20	04 40	05 07	05 30	16 27	17 30	18 35	19 40
N 10	04 55	05 21	05 42	16 22	17 21	18 23	19 26
0	05 07	05 32	05 54	16 17	17 13	18 12	19 13
S 10	05 18	05 43	06 05	16 12	17 05	18 01	19 00
20	05 27	05 53	06 16	16 07	16 56	17 49	18 46
30	05 36	06 05	06 29	16 01	16 46	17 36	18 30
35	05 41	06 11	06 37	15 58	16 41	17 28	18 21
40	05 45	06 17	06 46	15 54	16 34	17 19	18 10
45	05 50	06 25	06 56	15 50	16 27	17 09	17 58
S 50	05 55	06 33	07 08	15 44	16 18	16 57	17 43
52	05 57	06 37	07 13	15 42	16 14	16 51	17 36
54	05 59	06 42	07 20	15 39	16 09	16 45	17 28
56	06 02	06 46	07 26	15 37	16 05	16 38	17 19
58	06 04	06 51	07 34	15 33	15 59	16 30	17 10
S 60	06 07	06 57	07 43	15 30	15 53	16 21	16 59

Lat.	Sunset	Twilight		Moonset			
		Civil	Naut.	1	2	3	4
°	h m	h m	h m	h m	h m	h m	h m
N 72	22 16	////	////	02 53	02 46	02 37	02 24
N 70	21 33	////	////	02 59	02 59	03 00	03 04
68	21 04	23 10	////	03 04	03 09	03 18	03 31
66	20 43	22 09	////	03 08	03 18	03 32	03 52
64	20 26	21 36	////	03 11	03 26	03 44	04 09
62	20 12	21 13	23 15	03 14	03 32	03 54	04 23
60	20 00	20 54	22 21	03 17	03 38	04 03	04 35
N 58	19 50	20 39	21 51	03 19	03 43	04 11	04 46
56	19 41	20 26	21 29	03 22	03 47	04 18	04 55
54	19 33	20 15	21 11	03 24	03 51	04 24	05 03
52	19 26	20 05	20 57	03 25	03 55	04 29	05 10
50	19 20	19 57	20 44	03 27	03 58	04 34	05 16
45	19 06	19 39	20 20	03 30	04 06	04 45	05 30
N 40	18 55	19 25	20 01	03 33	04 12	04 54	05 42
35	18 46	19 13	19 46	03 36	04 17	05 02	05 52
30	18 38	19 03	19 34	03 38	04 22	05 09	06 00
20	18 24	18 47	19 14	03 42	04 30	05 21	06 15
N 10	18 12	18 34	18 59	03 46	04 37	05 31	06 28
0	18 00	18 22	18 47	03 49	04 43	05 41	06 41
S 10	17 49	18 11	18 36	03 52	04 50	05 50	06 53
20	17 37	18 00	18 26	03 55	04 57	06 01	07 06
30	17 24	17 49	18 17	03 59	05 05	06 13	07 21
35	17 16	17 43	18 13	04 02	05 10	06 20	07 30
40	17 08	17 36	18 08	04 04	05 15	06 28	07 40
45	16 58	17 28	18 03	04 07	05 21	06 37	07 52
S 50	16 45	17 20	17 58	04 11	05 29	06 48	08 06
52	16 40	17 16	17 56	04 12	05 32	06 53	08 13
54	16 34	17 11	17 54	04 14	05 36	06 59	08 20
56	16 27	17 07	17 51	04 16	05 40	07 05	08 28
58	16 19	17 02	17 49	04 18	05 45	07 12	08 38
S 60	16 10	16 56	17 46	04 21	05 50	07 21	08 48

Day	SUN			MOON			
	Eqn. of Time 00ʰ	Eqn. of Time 12ʰ	Mer. Pass.	Mer. Pass. Upper	Mer. Pass. Lower	Age	Phase
	m s	m s	h m	h m	h m	d	
1	02 53	02 57	11 57	22 30	10 03	13	○
2	03 00	03 04	11 57	23 27	10 58	14	
3	03 07	03 10	11 57	24 26	11 56	15	

1977 MAY 4, 5, 6 (WED., THURS., FRI.)

G.M.T.		ARIES	VENUS −4.2		MARS +1.3		JUPITER −1.5		SATURN +0.5		STARS		
		G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	Name	S.H.A.	Dec.
d	h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	° ′
4	00	221 46.0	214 07.6	N 5 11.3	216 48.2	N 0 50.4	157 06.3	N20 50.9	88 37.2	N18 34.5	Acamar	315 39.4	S40 23.8
	01	236 48.4	229 09.3	11.1	231 48.9	51.2	172 08.2	51.0	103 39.6	34.5	Achernar	335 47.6	S57 21.1
	02	251 50.9	244 11.0	10.9	246 49.6	52.0	187 10.0	51.1	118 41.9	34.4	Acrux	173 39.1	S62 58.7
	03	266 53.4	259 12.7	·· 10.7	261 50.3	·· 52.7	202 11.9	·· 51.2	133 44.3	·· 34.4	Adhara	255 34.1	S28 56.8
	04	281 55.8	274 14.4	10.5	276 51.0	53.5	217 13.8	51.3	148 46.7	34.4	Aldebaran	291 20.9	N16 27.7
	05	296 58.3	289 16.1	10.2	291 51.7	54.3	232 15.7	51.4	163 49.0	34.3			
	06	312 00.8	304 17.8	N 5 10.0	306 52.4	N 0 55.0	247 17.5	N20 51.5	178 51.4	N18 34.3	Alioth	166 44.1	N56 05.0
W	07	327 03.2	319 19.5	09.8	321 53.1	55.8	262 19.4	51.6	193 53.7	34.3	Alkaid	153 19.9	N49 25.6
E	08	342 05.7	334 21.1	09.6	336 53.8	56.6	277 21.3	51.7	208 56.1	34.3	Al Na'ir	28 18.0	S47 04.0
D	09	357 08.1	349 22.8	·· 09.4	351 54.5	·· 57.3	292 23.2	·· 51.8	223 58.5	·· 34.2	Alnilam	276 14.2	S 1 13.2
N	10	12 10.6	4 24.5	09.2	6 55.2	58.1	307 25.0	51.9	239 00.8	34.2	Alphard	218 22.8	S 8 33.9
E	11	27 13.1	19 26.2	09.0	21 55.9	58.9	322 26.9	52.0	254 03.2	34.2			
S	12	42 15.5	34 27.9	N 5 08.8	36 56.6	N 0 59.6	337 28.8	N20 52.1	269 05.6	N18 34.1	Alphecca	126 33.7	N26 47.4
D	13	57 18.0	49 29.5	08.6	51 57.3	1 00.4	352 30.7	52.2	284 07.9	34.1	Alpheratz	358 11.9	N28 57.8
A	14	72 20.5	64 31.2	08.4	66 58.0	01.2	7 32.5	52.3	299 10.3	34.1	Altair	62 34.6	N 8 48.5
Y	15	87 22.9	79 32.9	·· 08.2	81 58.7	·· 01.9	22 34.4	·· 52.4	314 12.6	·· 34.1	Ankaa	353 42.9	S42 25.6
	16	102 25.4	94 34.5	08.0	96 59.4	02.7	37 36.3	52.5	329 15.0	34.0	Antares	112 59.3	S26 22.9
	17	117 27.9	109 36.2	07.8	112 00.1	03.5	52 38.1	52.6	344 17.3	34.0			
	18	132 30.3	124 37.8	N 5 07.6	127 00.8	N 1 04.2	67 40.0	N20 52.7	359 19.7	N18 34.0	Arcturus	146 20.2	N19 18.0
	19	147 32.8	139 39.5	07.5	142 01.5	05.0	82 41.9	52.8	14 22.1	33.9	Atria	108 25.1	S68 59.1
	20	162 35.3	154 41.1	07.3	157 02.2	05.8	97 43.8	52.9	29 24.4	33.9	Avior	234 29.2	S59 26.6
	21	177 37.7	169 42.8	·· 07.1	172 02.9	·· 06.5	112 45.6	·· 53.0	44 26.8	·· 33.9	Bellatrix	279 01.5	N 6 19.6
	22	192 40.2	184 44.4	06.9	187 03.6	07.3	127 47.5	53.1	59 29.1	33.9	Betelgeuse	271 31.0	N 7 24.0
	23	207 42.6	199 46.1	06.7	202 04.3	08.1	142 49.4	53.2	74 31.5	33.8			
5	00	222 45.1	214 47.7	N 5 06.5	217 05.0	N 1 08.8	157 51.3	N20 53.3	89 33.9	N18 33.8	Canopus	264 08.6	S52 41.4
	01	237 47.6	229 49.3	06.4	232 05.7	09.6	172 53.1	53.4	104 36.2	33.8	Capella	281 15.1	N45 58.5
	02	252 50.0	244 51.0	06.2	247 06.4	10.4	187 55.0	53.5	119 38.6	33.7	Deneb	49 49.9	N45 11.8
	03	267 52.5	259 52.6	·· 06.0	262 07.1	·· 11.1	202 56.9	·· 53.6	134 40.9	·· 33.7	Denebola	183 01.2	N14 41.8
	04	282 55.0	274 54.2	05.9	277 07.8	11.9	217 58.7	53.7	149 43.3	33.7	Diphda	349 23.5	S18 06.7
	05	297 57.4	289 55.9	05.7	292 08.5	12.7	233 00.6	53.8	164 45.6	33.7			
	06	312 59.9	304 57.5	N 5 05.5	307 09.3	N 1 13.4	248 02.5	N20 53.9	179 48.0	N18 33.6	Dubhe	194 24.7	N61 52.5
	07	328 02.4	319 59.1	05.4	322 10.0	14.2	263 04.4	54.0	194 50.4	33.6	Elnath	278 47.3	N28 35.2
T	08	343 04.8	335 00.7	05.2	337 10.7	15.0	278 06.2	54.1	209 52.7	33.6	Eltanin	90 58.4	N51 29.4
H	09	358 07.3	350 02.3	·· 05.0	352 11.4	·· 15.7	293 08.1	·· 54.2	224 55.1	·· 33.5	Enif	34 13.9	N 9 46.2
U	10	13 09.7	5 03.9	04.9	7 12.1	16.5	308 10.0	54.3	239 57.4	33.5	Fomalhaut	15 54.1	S29 44.4
R	11	28 12.2	20 05.5	04.7	22 12.8	17.3	323 11.8	54.4	254 59.8	33.5			
S	12	43 14.7	35 07.1	N 5 04.5	37 13.5	N 1 18.0	338 13.7	N20 54.5	270 02.1	N18 33.4	Gacrux	172 30.7	S56 59.4
D	13	58 17.1	50 08.7	04.4	52 14.2	18.8	353 15.6	54.6	285 04.5	33.4	Gienah	176 20.1	S17 25.2
A	14	73 19.6	65 10.3	04.2	67 14.9	19.6	8 17.5	54.7	300 06.9	33.4	Hadar	149 25.9	S60 16.0
Y	15	88 22.1	80 11.9	·· 04.1	82 15.6	·· 20.3	23 19.3	·· 54.8	315 09.2	·· 33.4	Hamal	328 31.8	N23 21.2
	16	103 24.5	95 13.5	03.9	97 16.3	21.1	38 21.2	54.9	330 11.6	33.3	Kaus Aust.	84 19.6	S34 23.6
	17	118 27.0	110 15.1	03.8	112 17.0	21.9	53 23.1	55.0	345 13.9	33.3			
	18	133 29.5	125 16.7	N 5 03.6	127 17.7	N 1 22.6	68 24.9	N20 55.1	0 16.3	N18 33.3	Kochab	137 17.9	N74 15.0
	19	148 31.9	140 18.3	03.5	142 18.4	23.4	83 26.8	55.2	15 18.6	33.2	Markab	14 05.6	N15 04.9
	20	163 34.4	155 19.9	03.4	157 19.1	24.2	98 28.7	55.3	30 21.0	33.2	Menkar	314 43.8	N 3 59.9
	21	178 36.9	170 21.4	·· 03.2	172 19.8	·· 24.9	113 30.6	·· 55.4	45 23.3	·· 33.2	Menkent	148 39.3	S36 15.6
	22	193 39.3	185 23.0	03.1	187 20.5	25.7	128 32.4	55.5	60 25.7	33.1	Miaplacidus	221 45.3	S69 37.9
	23	208 41.8	200 24.6	02.9	202 21.2	26.5	143 34.3	55.6	75 28.1	33.1			
6	00	223 44.2	215 26.2	N 5 02.8	217 21.9	N 1 27.2	158 36.2	N20 55.7	90 30.4	N18 33.1	Mirfak	309 19.8	N49 46.8
	01	238 46.7	230 27.7	02.7	232 22.6	28.0	173 38.0	55.8	105 32.8	33.1	Nunki	76 31.8	S26 19.4
	02	253 49.2	245 29.3	02.5	247 23.3	28.7	188 39.9	55.9	120 35.1	33.0	Peacock	54 01.9	S56 48.2
	03	268 51.6	260 30.8	·· 02.4	262 24.0	·· 29.5	203 41.8	·· 56.0	135 37.5	·· 33.0	Pollux	244 01.1	N28 04.8
	04	283 54.1	275 32.4	02.3	277 24.7	30.3	218 43.6	56.1	150 39.8	33.0	Procyon	245 28.3	N 5 16.8
	05	298 56.6	290 34.0	02.1	292 25.4	31.0	233 45.5	56.2	165 42.2	32.9			
	06	313 59.0	305 35.5	N 5 02.0	307 26.1	N 1 31.8	248 47.4	N20 56.3	180 44.5	N18 32.9	Rasalhague	96 31.4	N12 34.5
	07	329 01.5	320 37.1	01.9	322 26.8	32.6	263 49.3	56.4	195 46.9	32.9	Regulus	208 12.4	N12 04.6
	08	344 04.0	335 38.6	01.8	337 27.5	33.3	278 51.1	56.5	210 49.2	32.8	Rigel	281 38.5	S 8 13.9
F	09	359 06.4	350 40.1	·· 01.7	352 28.2	·· 34.1	293 53.0	·· 56.6	225 51.6	·· 32.8	Rigil Kent.	140 28.2	S60 44.5
R	10	14 08.9	5 41.7	01.5	7 28.9	34.9	308 54.9	56.7	240 53.9	32.8	Sabik	102 43.5	S15 41.8
I	11	29 11.4	20 43.2	01.4	22 29.6	35.6	323 56.7	56.8	255 56.3	32.7			
D	12	44 13.8	35 44.8	N 5 01.3	37 30.3	N 1 36.4	338 58.6	N20 56.9	270 58.6	N18 32.7	Schedar	350 12.0	N56 24.6
A	13	59 16.3	50 46.3	01.2	52 31.0	37.2	354 00.5	57.0	286 01.0	32.7	Shaula	96 58.5	S37 05.1
Y	14	74 18.7	65 47.8	01.1	67 31.7	37.9	9 02.3	57.1	301 03.3	32.7	Sirius	258 57.9	S16 41.4
	15	89 21.2	80 49.4	·· 01.0	82 32.4	·· 38.7	24 04.2	·· 57.2	316 05.7	·· 32.6	Spica	158 59.6	S11 02.7
	16	104 23.7	95 50.9	00.9	97 33.1	39.5	39 06.1	57.3	331 08.0	32.6	Suhail	223 12.4	S43 20.9
	17	119 26.1	110 52.4	00.8	112 33.9	40.2	54 08.0	57.4	346 10.4	32.6			
	18	134 28.6	125 53.9	N 5 00.6	127 34.6	N 1 41.0	69 09.8	N20 57.5	1 12.7	N18 32.5	Vega	80 57.1	N38 45.6
	19	149 31.1	140 55.4	00.5	142 35.3	41.7	84 11.7	57.6	16 15.1	32.5	Zuben'ubi	137 35.2	S15 56.9
	20	164 33.5	155 56.9	00.4	157 36.0	42.5	99 13.6	57.7	31 17.4	32.5		S.H.A.	Mer. Pass.
	21	179 36.0	170 58.5	·· 00.3	172 36.7	·· 43.3	114 15.4	·· 57.8	46 19.8	·· 32.4		° ′	h m
	22	194 38.5	186 00.0	00.2	187 37.4	44.0	129 17.3	57.9	61 22.1	32.4	Venus	352 02.6	9 40
	23	209 40.9	201 01.5	00.1	202 38.1	44.8	144 19.2	58.0	76 24.5	32.4	Mars	354 19.9	9 31
Mer. Pass.		h m 9 07.5	v 1.6	d 0.2	v 0.7	d 0.8	v 1.9	d 0.1	v 2.4	d 0.0	Jupiter Saturn	295 06.1 226 48.8	13 27 17 59

	G.M.T.	SUN G.H.A.	SUN Dec.	MOON G.H.A.	MOON v	MOON Dec.	MOON d	MOON H.P.
	d h	° ′	° ′	° ′	′	° ′	′	′
	4 00	180 48.4	N15 52.0	353 41.3	4.6	S15 31.0	7.0	61.3
	01	195 48.4	52.7	8 04.9	4.6	15 38.0	6.9	61.3
	02	210 48.5	53.4	22 28.5	4.5	15 44.9	6.7	61.3
	03	225 48.5	·· 54.2	36 52.0	4.5	15 51.6	6.7	61.3
	04	240 48.6	54.9	51 15.5	4.5	15 58.3	6.5	61.3
	05	255 48.7	55.6	65 39.0	4.4	16 04.8	6.4	61.3
	06	270 48.7	N15 56.3	80 02.4	4.4	S16 11.2	6.3	61.3
W	07	285 48.8	57.1	94 25.8	4.3	16 17.5	6.2	61.3
E	08	300 48.8	57.8	108 49.1	4.3	16 23.7	6.1	61.3
D	09	315 48.9	·· 58.5	123 12.4	4.2	16 29.8	5.9	61.3
N	10	330 49.0	15 59.2	137 35.6	4.3	16 35.7	5.8	61.3
E	11	345 49.0	16 00.0	151 58.9	4.1	16 41.5	5.7	61.3
S	12	0 49.1	N16 00.7	166 22.0	4.2	S16 47.2	5.6	61.3
D	13	15 49.1	01.4	180 45.2	4.1	16 52.8	5.4	61.3
A	14	30 49.2	02.1	195 08.3	4.1	16 58.2	5.3	61.3
Y	15	45 49.3	·· 02.8	209 31.4	4.1	17 03.5	5.2	61.3
	16	60 49.3	03.6	223 54.5	4.0	17 08.7	5.1	61.3
	17	75 49.4	04.3	238 17.5	4.0	17 13.8	4.9	61.3
	18	90 49.4	N16 05.0	252 40.5	4.0	S17 18.7	4.8	61.2
	19	105 49.5	05.7	267 03.5	4.0	17 23.5	4.7	61.2
	20	120 49.6	06.4	281 26.5	4.0	17 28.2	4.5	61.2
	21	135 49.6	·· 07.2	295 49.5	3.9	17 32.7	4.4	61.2
	22	150 49.7	07.9	310 12.4	3.9	17 37.1	4.3	61.2
	23	165 49.7	08.6	324 35.3	3.9	17 41.4	4.1	61.2
	5 00	180 49.8	N16 09.3	338 58.2	3.9	S17 45.5	4.0	61.2
	01	195 49.8	10.0	353 21.1	3.8	17 49.5	3.9	61.2
	02	210 49.9	10.7	7 43.9	3.9	17 53.4	3.7	61.2
	03	225 49.9	·· 11.5	22 06.8	3.8	17 57.1	3.6	61.2
	04	240 50.0	12.2	36 29.6	3.9	18 00.7	3.5	61.1
	05	255 50.1	12.9	50 52.5	3.8	18 04.2	3.3	61.1
	06	270 50.1	N16 13.6	65 15.3	3.9	S18 07.5	3.2	61.1
	07	285 50.2	14.3	79 38.2	3.8	18 10.7	3.0	61.1
T	08	300 50.2	15.0	94 01.0	3.8	18 13.7	2.9	61.1
H	09	315 50.3	·· 15.7	108 23.8	3.8	18 16.6	2.8	61.1
U	10	330 50.3	16.5	122 46.6	3.9	18 19.4	2.7	61.1
R	11	345 50.4	17.2	137 09.5	3.8	18 22.1	2.5	61.0
S	12	0 50.4	N16 17.9	151 32.3	3.8	S18 24.6	2.3	61.0
D	13	15 50.5	18.6	165 55.1	3.9	18 26.9	2.3	61.0
A	14	30 50.5	19.3	180 18.0	3.8	18 29.2	2.0	61.0
Y	15	45 50.6	·· 20.0	194 40.8	3.9	18 31.2	2.0	61.0
	16	60 50.6	20.7	209 03.7	3.9	18 33.2	1.8	61.0
	17	75 50.7	21.4	223 26.6	3.8	18 35.0	1.7	60.9
	18	90 50.8	N16 22.1	237 49.4	3.9	S18 36.7	1.5	60.9
	19	105 50.8	22.8	252 12.3	4.0	18 38.2	1.4	60.9
	20	120 50.9	23.6	266 35.3	3.9	18 39.6	1.2	60.9
	21	135 50.9	·· 24.3	280 58.2	4.0	18 40.8	1.2	60.9
	22	150 51.0	25.0	295 21.2	3.9	18 42.0	0.9	60.8
	23	165 51.0	25.7	309 44.1	4.1	18 42.9	0.9	60.8
	6 00	180 51.1	N16 26.4	324 07.2	4.0	S18 43.8	0.7	60.8
	01	195 51.1	27.1	338 30.2	4.0	18 44.5	0.5	60.8
	02	210 51.2	27.8	352 53.2	4.1	18 45.0	0.5	60.7
	03	225 51.2	·· 28.5	7 16.3	4.1	18 45.5	0.3	60.7
	04	240 51.3	29.2	21 39.4	4.2	18 45.8	0.1	60.7
	05	255 51.3	29.9	36 02.6	4.2	18 45.9	0.0	60.7
	06	270 51.4	N16 30.6	50 25.8	4.2	S18 45.9	0.1	60.7
	07	285 51.4	31.3	64 49.0	4.2	18 45.8	0.3	60.6
	08	300 51.5	32.0	79 12.2	4.3	18 45.5	0.3	60.6
F	09	315 51.5	·· 32.7	93 35.5	4.4	18 45.2	0.6	60.6
R	10	330 51.5	33.4	107 58.9	4.3	18 44.6	0.6	60.5
I	11	345 51.6	34.1	122 22.2	4.5	18 44.0	0.8	60.5
D	12	0 51.6	N16 34.8	136 45.7	4.4	S18 43.2	1.0	60.5
A	13	15 51.7	35.5	151 09.1	4.5	18 42.2	1.0	60.5
Y	14	30 51.7	36.2	165 32.6	4.6	18 41.2	1.2	60.4
	15	45 51.8	·· 36.9	179 56.2	4.6	18 40.0	1.4	60.4
	16	60 51.8	37.6	194 19.8	4.6	18 38.6	1.4	60.4
	17	75 51.9	38.3	208 43.4	4.7	18 37.2	1.6	60.4
	18	90 51.9	N16 39.0	223 07.1	4.8	S18 35.6	1.7	60.3
	19	105 52.0	39.7	237 30.9	4.8	18 33.9	1.9	60.3
	20	120 52.0	40.4	251 54.7	4.8	18 32.0	2.0	60.3
	21	135 52.1	·· 41.1	266 18.5	5.0	18 30.0	2.1	60.2
	22	150 52.1	41.8	280 42.5	4.9	18 27.9	2.2	60.2
	23	165 52.1	42.5	295 06.4	5.1	18 25.7	2.4	60.2
		S.D. 15.9	*d* 0.7	S.D. 16.7		16.6		16.5

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 4	Moonrise 5	Moonrise 6	Moonrise 7
°	h m	h m	h m	h m	h m	h m	h m
N 72	////	////	01 16	■	■	■	■
N 70	////	////	02 07	23 33	25 07	01 07	01 53
68	////	////	02 39	22 53	24 16	00 16	01 08
66	////	01 30	03 02	22 25	23 44	24 39	00 39
64	////	02 07	03 20	22 04	23 20	24 17	00 17
62	////	02 32	03 35	21 47	23 01	23 59	24 40
60	01 20	02 52	03 48	21 33	22 46	23 44	24 27
N 58	01 54	03 08	03 58	21 21	22 33	23 31	24 16
56	02 17	03 22	04 08	21 11	22 21	23 20	24 06
54	02 36	03 33	04 16	21 01	22 12	23 10	23 58
52	02 51	03 44	04 23	20 53	22 03	23 02	23 50
50	03 04	03 53	04 30	20 46	21 55	22 54	23 43
45	03 30	04 11	04 44	20 30	21 38	22 38	23 29
N 40	03 50	04 26	04 55	20 17	21 24	22 24	23 17
35	04 05	04 38	05 05	20 06	21 12	22 13	23 06
30	04 18	04 48	05 14	19 57	21 02	22 03	22 57
20	04 38	05 05	05 29	19 40	20 45	21 45	22 41
N 10	04 54	05 19	05 41	19 26	20 29	21 30	22 28
0	05 07	05 32	05 53	19 13	20 15	21 16	22 15
S 10	05 18	05 43	06 05	19 00	20 01	21 02	22 02
20	05 28	05 54	06 17	18 46	19 46	20 47	21 48
30	05 38	06 06	06 31	18 30	19 28	20 30	21 32
35	05 43	06 13	06 39	18 21	19 18	20 20	21 23
40	05 48	06 20	06 49	18 10	19 07	20 08	21 13
45	05 53	06 28	06 59	17 58	18 53	19 55	21 01
S 50	05 59	06 38	07 12	17 43	18 37	19 38	20 46
52	06 01	06 42	07 18	17 36	18 29	19 31	20 39
54	06 04	06 46	07 25	17 28	18 20	19 22	20 31
56	06 07	06 52	07 32	17 19	18 11	19 12	20 22
58	06 10	06 57	07 41	17 10	18 00	19 02	20 12
S 60	06 13	07 03	07 50	16 59	17 47	18 49	20 01

Lat.	Sunset	Twilight Civil	Twilight Naut.	Moonset 4	Moonset 5	Moonset 6	Moonset 7
°	h m	h m	h m	h m	h m	h m	h m
N 72	22 49	////	////	02 24	■	■	■
N 70	21 51	////	////	03 04	03 15	03 51	05 13
68	21 18	////	////	03 31	03 56	04 43	05 57
66	20 54	22 30	////	03 52	04 24	05 15	06 26
64	20 35	21 51	////	04 09	04 46	05 39	06 48
62	20 20	21 24	////	04 23	05 03	05 57	07 06
60	20 07	21 03	22 40	04 35	05 18	06 13	07 20
N 58	19 56	20 47	22 03	04 46	05 30	06 26	07 33
56	19 47	20 33	21 39	04 55	05 41	06 37	07 44
54	19 39	20 21	21 19	05 03	05 50	06 47	07 53
52	19 31	20 11	21 04	05 10	05 59	06 56	08 02
50	19 24	20 02	20 50	05 16	06 06	07 04	08 09
45	19 10	19 43	20 24	05 30	06 22	07 21	08 25
N 40	18 58	19 28	20 05	05 42	06 36	07 35	08 38
35	18 48	19 16	19 49	05 52	06 47	07 47	08 50
30	18 40	19 05	19 36	06 00	06 57	07 57	08 59
20	18 25	18 48	19 16	06 15	07 14	08 15	09 16
N 10	18 12	18 34	19 00	06 28	07 29	08 30	09 31
0	18 00	18 22	18 47	06 41	07 42	08 44	09 44
S 10	17 48	18 10	18 35	06 53	07 56	08 59	09 58
20	17 36	17 59	18 25	07 06	08 11	09 14	10 12
30	17 22	17 47	18 15	07 21	08 28	09 31	10 29
35	17 13	17 40	18 10	07 30	08 38	09 41	10 38
40	17 04	17 33	18 05	07 40	08 49	09 53	10 49
45	16 53	17 25	18 00	07 52	09 03	10 07	11 02
S 50	16 40	17 15	17 54	08 06	09 19	10 23	11 18
52	16 34	17 11	17 51	08 13	09 26	10 31	11 25
54	16 28	17 06	17 48	08 20	09 35	10 40	11 33
56	16 20	17 01	17 46	08 28	09 44	10 49	11 42
58	16 12	16 55	17 43	08 38	09 55	11 00	11 52
S 60	16 02	16 49	17 39	08 48	10 07	11 13	12 04

Day	SUN Eqn. of Time 00ʰ	SUN Eqn. of Time 12ʰ	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
	m s	m s	h m	h m	h m	d	
4	03 13	03 16	11 57	00 26	12 57	16	○
5	03 19	03 22	11 57	01 28	13 59	17	
6	03 24	03 26	11 57	02 30	15 00	18	

1977 MAY 7, 8, 9 (SAT., SUN., MON.)

	G.M.T.	ARIES	VENUS −4.2		MARS +1.3		JUPITER −1.5		SATURN +0.5	
		G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
	d h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
	7 00	224 43.4	216 03.0	N 5 00.1	217 38.8	N 1 45.6	159 21.0	N20 58.1	91 26.8	N18 32.3
	01	239 45.8	231 04.5	5 00.0	232 39.5	46.3	174 22.9	58.2	106 29.2	32.3
	02	254 48.3	246 06.0	4 59.9	247 40.2	47.1	189 24.8	58.3	121 31.5	32.3
	03	269 50.8	261 07.5	·· 59.8	262 40.9	·· 47.9	204 26.6	·· 58.4	136 33.9	·· 32.2
	04	284 53.2	276 08.9	59.7	277 41.6	48.6	219 28.5	58.5	151 36.2	32.2
	05	299 55.7	291 10.4	59.6	292 42.3	49.4	234 30.4	58.6	166 38.6	32.2
	06	314 58.2	306 11.9	N 4 59.5	307 43.0	N 1 50.1	249 32.2	N20 58.7	181 40.9	N18 32.2
	07	330 00.6	321 13.4	59.4	322 43.7	50.9	264 34.1	58.7	196 43.3	32.1
S	08	345 03.1	336 14.9	59.4	337 44.4	51.7	279 36.0	58.8	211 45.6	32.1
A	09	0 05.6	351 16.4	·· 59.3	352 45.1	·· 52.4	294 37.9	·· 58.9	226 48.0	·· 32.1
T	10	15 08.0	6 17.8	59.2	7 45.8	53.2	309 39.7	59.0	241 50.3	32.0
U	11	30 10.5	21 19.3	59.1	22 46.5	54.0	324 41.6	59.1	256 52.7	32.0
R	12	45 13.0	36 20.8	N 4 59.1	37 47.2	N 1 54.7	339 43.5	N20 59.2	271 55.0	N18 32.0
D	13	60 15.4	51 22.2	59.0	52 47.9	55.5	354 45.3	59.3	286 57.4	31.9
A	14	75 17.9	66 23.7	58.9	67 48.6	56.3	9 47.2	59.4	301 59.7	31.9
Y	15	90 20.3	81 25.2	·· 58.8	82 49.3	·· 57.0	24 49.1	·· 59.5	317 02.1	·· 31.9
	16	105 22.8	96 26.6	58.8	97 50.0	57.8	39 50.9	59.6	332 04.4	31.8
	17	120 25.3	111 28.1	58.7	112 50.7	58.5	54 52.8	59.7	347 06.8	31.8
	18	135 27.7	126 29.5	N 4 58.6	127 51.4	N 1 59.3	69 54.7	N20 59.8	2 09.1	N18 31.8
	19	150 30.2	141 31.0	58.6	142 52.1	2 00.1	84 56.5	20 59.9	17 11.5	31.7
	20	165 32.7	156 32.4	58.5	157 52.9	00.8	99 58.4	21 00.0	32 13.8	31.7
	21	180 35.1	171 33.9	·· 58.5	172 53.6	·· 01.6	115 00.3	·· 00.1	47 16.2	·· 31.7
	22	195 37.6	186 35.3	58.4	187 54.3	02.4	130 02.1	00.2	62 18.5	31.6
	23	210 40.1	201 36.8	58.3	202 55.0	03.1	145 04.0	00.3	77 20.8	31.6
	8 00	225 42.5	216 38.2	N 4 58.3	217 55.7	N 2 03.9	160 05.9	N21 00.4	92 23.2	N18 31.6
	01	240 45.0	231 39.6	58.2	232 56.4	04.6	175 07.7	00.5	107 25.5	31.5
	02	255 47.5	246 41.1	58.2	247 57.1	05.4	190 09.6	00.6	122 27.9	31.5
	03	270 49.9	261 42.5	·· 58.1	262 57.8	·· 06.2	205 11.5	·· 00.7	137 30.2	·· 31.5
	04	285 52.4	276 43.9	58.1	277 58.5	06.9	220 13.3	00.8	152 32.6	31.4
	05	300 54.8	291 45.3	58.0	292 59.2	07.7	235 15.2	00.9	167 34.9	31.4
	06	315 57.3	306 46.8	N 4 58.0	307 59.9	N 2 08.5	250 17.1	N21 01.0	182 37.3	N18 31.4
	07	330 59.8	321 48.2	58.0	323 00.6	09.2	265 18.9	01.1	197 39.6	31.3
	08	346 02.2	336 49.6	57.9	338 01.3	10.0	280 20.8	01.2	212 42.0	31.3
S	09	1 04.7	351 51.0	·· 57.9	353 02.0	·· 10.7	295 22.7	·· 01.3	227 44.3	·· 31.3
U	10	16 07.2	6 52.4	57.8	8 02.7	11.5	310 24.5	01.4	242 46.6	31.2
N	11	31 09.6	21 53.8	57.8	23 03.4	12.3	325 26.4	01.5	257 49.0	31.2
D	12	46 12.1	36 55.2	N 4 57.8	38 04.1	N 2 13.0	340 28.3	N21 01.6	272 51.3	N18 31.2
A	13	61 14.6	51 56.6	57.7	53 04.8	13.8	355 30.1	01.7	287 53.7	31.1
Y	14	76 17.0	66 58.1	57.7	68 05.5	14.5	10 32.0	01.8	302 56.0	31.1
	15	91 19.5	81 59.4	·· 57.7	83 06.2	·· 15.3	25 33.9	·· 01.9	317 58.4	·· 31.1
	16	106 21.9	97 00.8	57.6	98 06.9	16.1	40 35.7	02.0	333 00.7	31.0
	17	121 24.4	112 02.2	57.6	113 07.6	16.8	55 37.6	02.1	348 03.0	31.0
	18	136 26.9	127 03.6	N 4 57.6	128 08.3	N 2 17.6	70 39.5	N21 02.2	3 05.4	N18 31.0
	19	151 29.3	142 05.0	57.6	143 09.0	18.4	85 41.3	02.3	18 07.7	30.9
	20	166 31.8	157 06.4	57.5	158 09.8	19.1	100 43.2	02.4	33 10.1	30.9
	21	181 34.3	172 07.8	·· 57.5	173 10.5	·· 19.9	115 45.1	·· 02.5	48 12.4	·· 30.9
	22	196 36.7	187 09.2	57.5	188 11.2	20.6	130 46.9	02.6	63 14.8	30.8
	23	211 39.2	202 10.5	57.5	203 11.9	21.4	145 48.8	02.7	78 17.1	30.8
	9 00	226 41.7	217 11.9	N 4 57.5	218 12.6	N 2 22.2	160 50.7	N21 02.8	93 19.4	N18 30.8
	01	241 44.1	232 13.3	57.5	233 13.3	22.9	175 52.5	02.8	108 21.8	30.7
	02	256 46.6	247 14.7	57.5	248 14.0	23.7	190 54.4	02.9	123 24.1	30.7
	03	271 49.1	262 16.0	·· 57.4	263 14.7	·· 24.4	205 56.3	·· 03.0	138 26.5	·· 30.7
	04	286 51.5	277 17.4	57.4	278 15.4	25.2	220 58.1	03.1	153 28.8	30.6
	05	301 54.0	292 18.8	57.4	293 16.1	26.0	236 00.0	03.2	168 31.1	30.6
	06	316 56.4	307 20.1	N 4 57.4	308 16.8	N 2 26.7	251 01.8	N21 03.3	183 33.5	N18 30.6
	07	331 58.9	322 21.5	57.4	323 17.5	27.5	266 03.7	03.4	198 35.8	30.5
	08	347 01.4	337 22.8	57.4	338 18.2	28.2	281 05.6	03.5	213 38.2	30.5
M	09	2 03.8	352 24.2	·· 57.4	353 18.9	·· 29.0	296 07.4	·· 03.6	228 40.5	·· 30.5
O	10	17 06.3	7 25.5	57.4	8 19.6	29.8	311 09.3	03.7	243 42.8	30.4
N	11	32 08.8	22 26.9	57.4	23 20.3	30.5	326 11.2	03.8	258 45.2	30.4
D	12	47 11.2	37 28.2	N 4 57.4	38 21.0	N 2 31.3	341 13.0	N21 03.9	273 47.5	N18 30.4
A	13	62 13.7	52 29.6	57.4	53 21.7	32.0	356 14.9	04.0	288 49.9	30.3
Y	14	77 16.2	67 30.9	57.4	68 22.4	32.8	11 16.8	04.1	303 52.2	30.3
	15	92 18.6	82 32.2	·· 57.4	83 23.1	·· 33.6	26 18.6	·· 04.2	318 54.5	·· 30.3
	16	107 21.1	97 33.6	57.5	98 23.8	34.3	41 20.5	04.3	333 56.9	30.2
	17	122 23.6	112 34.9	57.5	113 24.6	35.1	56 22.4	04.4	348 59.2	30.2
	18	137 26.0	127 36.2	N 4 57.5	128 25.3	N 2 35.8	71 24.2	N21 04.5	4 01.6	N18 30.2
	19	152 28.5	142 37.6	57.5	143 26.0	36.6	86 26.1	04.6	19 03.9	30.1
	20	167 30.9	157 38.9	57.5	158 26.7	37.4	101 28.0	04.7	34 06.2	30.1
	21	182 33.4	172 40.2	·· 57.5	173 27.4	·· 38.1	116 29.8	·· 04.8	49 08.6	·· 30.1
	22	197 35.9	187 41.5	57.5	188 28.1	38.9	131 31.7	04.9	64 10.9	30.0
	23	212 38.3	202 42.9	57.6	203 28.8	39.6	146 33.5	05.0	79 13.2	30.0
	Mer. Pass.	h m 8 55.7	*v* 1.4	*d* 0.0	*v* 0.7	*d* 0.8	*v* 1.9	*d* 0.1	*v* 2.3	*d* 0.0

STARS

Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 39.4	S40 23.8
Achernar	335 47.6	S57 21.0
Acrux	173 39.1	S62 58.7
Adhara	255 34.1	S28 56.8
Aldebaran	291 20.9	N16 27.7
Alioth	166 44.1	N56 05.1
Alkaid	153 19.9	N49 25.6
Al Na'ir	28 17.9	S47 04.0
Alnilam	276 14.2	S 1 13.2
Alphard	218 22.8	S 8 33.8
Alphecca	126 33.7	N26 47.4
Alpheratz	358 11.9	N28 57.8
Altair	62 34.6	N 8 48.5
Ankaa	353 42.9	S42 25.6
Antares	112 59.3	S26 22.9
Arcturus	146 20.2	N19 18.0
Atria	108 25.0	S68 59.1
Avior	234 29.2	S59 26.6
Bellatrix	279 01.5	N 6 19.6
Betelgeuse	271 31.0	N 7 24.0
Canopus	264 08.6	S52 41.4
Capella	281 15.1	N45 58.5
Deneb	49 49.9	N45 11.8
Denebola	183 01.2	N14 41.9
Diphda	349 23.4	S18 06.7
Dubhe	194 24.7	N61 52.6
Elnath	278 47.3	N28 35.2
Eltanin	90 58.4	N51 29.4
Enif	34 13.8	N 9 46.2
Fomalhaut	15 54.1	S29 44.4
Gacrux	172 30.7	S56 59.4
Gienah	176 20.1	S17 25.2
Hadar	149 25.9	S60 16.0
Hamal	328 31.8	N23 21.2
Kaus Aust.	84 19.6	S34 23.6
Kochab	137 17.9	N74 15.0
Markab	14 05.6	N15 04.9
Menkar	314 43.8	N 3 59.9
Menkent	148 39.3	S36 15.6
Miaplacidus	221 45.3	S69 37.9
Mirfak	309 19.8	N49 46.8
Nunki	76 31.8	S26 19.4
Peacock	54 01.9	S56 48.2
Pollux	244 01.1	N28 04.8
Procyon	245 28.3	N 5 16.8
Rasalhague	96 31.4	N12 34.5
Regulus	208 12.4	N12 04.6
Rigel	281 38.5	S 8 13.9
Rigil Kent.	140 28.2	S60 44.5
Sabik	102 43.4	S15 41.8
Schedar	350 12.0	N56 24.6
Shaula	96 58.5	S37 05.1
Sirius	258 57.9	S16 41.4
Spica	158 59.6	S11 02.7
Suhail	223 12.4	S43 20.9
Vega	80 57.1	N38 45.6
Zuben'ubi	137 35.2	S15 56.9

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	350 55.7	9 33
Mars	352 13.1	9 28
Jupiter	294 23.3	13 18
Saturn	226 40.7	17 48

G.M.T.		SUN G.H.A.	SUN Dec.	MOON G.H.A.	v	MOON Dec.	d	H.P.
d	h	° ′	° ′	° ′	′	° ′	′	′
7	00	180 52.2	N16 43.2	309 30.5	5.1	S18 23.3	2.5	60.2
	01	195 52.2	43.9	323 54.6	5.1	18 20.8	2.6	60.1
	02	210 52.3	44.6	338 18.7	5.2	18 18.2	2.7	60.1
	03	225 52.3	· · 45.3	352 42.9	5.3	18 15.5	2.9	60.1
	04	240 52.4	45.9	7 07.2	5.4	18 12.6	2.9	60.0
	05	255 52.4	46.6	21 31.6	5.4	18 09.7	3.1	60.0
	06	270 52.5	N16 47.3	35 56.0	5.4	S18 06.6	3.3	60.0
	07	285 52.5	48.0	50 20.4	5.6	18 03.3	3.3	59.9
S	08	300 52.5	48.7	64 45.0	5.6	18 00.0	3.5	59.9
A	09	315 52.6	· · 49.4	79 09.6	5.7	17 56.5	3.6	59.9
T	10	330 52.6	50.1	93 34.3	5.7	17 52.9	3.6	59.8
U	11	345 52.7	50.8	107 59.0	5.8	17 49.3	3.9	59.8
R	12	0 52.7	N16 51.5	122 23.8	5.9	S17 45.4	3.9	59.8
D	13	15 52.7	52.2	136 48.7	6.0	17 41.5	4.0	59.7
A	14	30 52.8	52.8	151 13.7	6.0	17 37.5	4.2	59.7
Y	15	45 52.8	· · 53.5	165 38.7	6.1	17 33.3	4.2	59.7
	16	60 52.9	54.2	180 03.8	6.2	17 29.1	4.4	59.6
	17	75 52.9	54.9	194 29.0	6.3	17 24.7	4.5	59.6
	18	90 52.9	N16 55.6	208 54.3	6.3	S17 20.2	4.6	59.6
	19	105 53.0	56.3	223 19.6	6.4	17 15.6	4.7	59.5
	20	120 53.0	57.0	237 45.0	6.5	17 10.9	4.8	59.5
	21	135 53.1	· · 57.6	252 10.5	6.6	17 06.1	4.9	59.5
	22	150 53.1	58.3	266 36.1	6.6	17 01.2	5.0	59.4
	23	165 53.1	59.0	281 01.7	6.8	16 56.2	5.2	59.4
8	00	180 53.2	N16 59.7	295 27.5	6.8	S16 51.0	5.2	59.4
	01	195 53.2	17 00.4	309 53.3	6.9	16 45.8	5.3	59.3
	02	210 53.3	01.1	324 19.2	6.9	16 40.5	5.4	59.3
	03	225 53.3	· · 01.7	338 45.1	7.1	16 35.1	5.6	59.2
	04	240 53.3	02.4	353 11.2	7.1	16 29.5	5.6	59.2
	05	255 53.4	03.1	7 37.3	7.2	16 23.9	5.7	59.2
	06	270 53.4	N17 03.8	22 03.5	7.3	S16 18.2	5.8	59.1
	07	285 53.4	04.5	36 29.8	7.4	16 12.4	5.9	59.1
	08	300 53.5	05.1	50 56.2	7.4	16 06.5	6.0	59.1
S	09	315 53.5	· · 05.8	65 22.6	7.6	16 00.5	6.1	59.0
U	10	330 53.6	06.5	79 49.2	7.6	15 54.4	6.2	59.0
N	11	345 53.6	07.2	94 15.8	7.7	15 48.2	6.3	59.0
D	12	0 53.6	N17 07.8	108 42.5	7.8	S15 41.9	6.3	58.9
A	13	15 53.7	08.5	123 09.3	7.8	15 35.6	6.5	58.9
Y	14	30 53.7	09.2	137 36.1	8.0	15 29.1	6.5	58.8
	15	45 53.7	· · 09.9	152 03.1	8.0	15 22.6	6.6	58.8
	16	60 53.8	10.5	166 30.1	8.1	15 16.0	6.7	58.8
	17	75 53.8	11.2	180 57.2	8.2	15 09.3	6.8	58.7
	18	90 53.8	N17 11.9	195 24.4	8.3	S15 02.5	6.9	58.7
	19	105 53.9	12.6	209 51.7	8.4	14 55.6	6.9	58.7
	20	120 53.9	13.2	224 19.1	8.4	14 48.7	7.1	58.6
	21	135 53.9	· · 13.9	238 46.5	8.5	14 41.6	7.1	58.6
	22	150 54.0	14.6	253 14.0	8.7	14 34.5	7.2	58.6
	23	165 54.0	15.2	267 41.7	8.6	14 27.3	7.2	58.5
9	00	180 54.0	N17 15.9	282 09.3	8.8	S14 20.1	7.3	58.5
	01	195 54.1	16.6	296 37.1	8.9	14 12.8	7.4	58.4
	02	210 54.1	17.3	311 05.0	8.9	14 05.4	7.5	58.4
	03	225 54.1	· · 17.9	325 32.9	9.1	13 57.9	7.6	58.4
	04	240 54.2	18.6	340 01.0	9.1	13 50.3	7.6	58.3
	05	255 54.2	19.3	354 29.1	9.1	13 42.7	7.7	58.3
	06	270 54.2	N17 19.9	8 57.2	9.3	S13 35.0	7.7	58.3
	07	285 54.2	20.6	23 25.5	9.4	13 27.3	7.9	58.2
	08	300 54.3	21.3	37 53.9	9.4	13 19.4	7.9	58.2
M	09	315 54.3	· · 21.9	52 22.3	9.5	13 11.5	7.9	58.2
O	10	330 54.3	22.6	66 50.8	9.6	13 03.6	8.0	58.1
N	11	345 54.4	23.3	81 19.4	9.7	12 55.6	8.1	58.1
D	12	0 54.4	N17 23.9	95 48.1	9.7	S12 47.5	8.2	58.0
A	13	15 54.4	24.6	110 16.8	9.8	12 39.3	8.2	58.0
Y	14	30 54.5	25.3	124 45.6	9.9	12 31.1	8.2	58.0
	15	45 54.5	· · 25.9	139 14.5	10.0	12 22.9	8.3	57.9
	16	60 54.5	26.6	153 43.5	10.1	12 14.6	8.4	57.9
	17	75 54.5	27.2	168 12.6	10.1	12 06.2	8.4	57.9
	18	90 54.6	N17 27.9	182 41.7	10.2	S11 57.8	8.5	57.8
	19	105 54.6	28.6	197 10.9	10.3	11 49.3	8.6	57.8
	20	120 54.6	29.2	211 40.2	10.4	11 40.7	8.6	57.8
	21	135 54.6	· · 29.9	226 09.6	10.4	11 32.1	8.6	57.7
	22	150 54.7	30.5	240 39.0	10.5	11 23.5	8.7	57.7
	23	165 54.7	31.2	255 08.5	10.6	11 14.8	8.7	57.7
		S.D. 15.9	d 0.7	S.D. 16.3		16.1		15.8

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 7	Moonrise 8	Moonrise 9	Moonrise 10
°	h m	h m	h m	h m	h m	h m	h m
N 72	////	////	00 29	■	02 56	02 41	02 31
N 70	////	////	01 47	01 53	02 08	02 12	02 14
68	////	////	02 25	01 08	01 36	01 51	02 00
66	////	01 05	02 50	00 39	01 13	01 34	01 48
64	////	01 51	03 10	00 17	00 55	01 21	01 39
62	////	02 21	03 26	24 40	00 40	01 09	01 30
60	00 58	02 42	03 40	24 27	00 27	00 59	01 23
N 58	01 40	03 00	03 51	24 16	00 16	00 50	01 17
56	02 07	03 14	04 01	24 06	00 06	00 42	01 11
54	02 27	03 27	04 10	23 58	24 36	00 36	01 06
52	02 44	03 38	04 18	23 50	24 29	00 29	01 02
50	02 58	03 47	04 25	23 43	24 24	00 24	00 58
45	03 25	04 07	04 40	23 29	24 12	00 12	00 49
N 40	03 45	04 22	04 52	23 17	24 02	00 02	00 41
35	04 02	04 35	05 02	23 06	23 53	24 35	00 35
30	04 15	04 46	05 12	22 57	23 46	24 29	00 29
20	04 36	05 04	05 27	22 41	23 32	24 19	00 19
N 10	04 53	05 18	05 40	22 28	23 21	24 10	00 10
0	05 06	05 31	05 53	22 15	23 10	24 02	00 02
S 10	05 18	05 43	06 05	22 02	22 59	23 54	24 46
20	05 29	05 55	06 18	21 48	22 48	23 45	24 40
30	05 39	06 08	06 33	21 32	22 35	23 35	24 33
35	05 45	06 15	06 42	21 23	22 27	23 29	24 30
40	05 50	06 23	06 51	21 13	22 18	23 23	24 25
45	05 56	06 32	07 03	21 01	22 08	23 15	24 20
S 50	06 03	06 42	07 17	20 46	21 56	23 06	24 15
52	06 06	06 46	07 23	20 39	21 50	23 01	24 12
54	06 08	06 51	07 30	20 31	21 43	22 57	24 09
56	06 12	06 57	07 38	20 22	21 36	22 51	24 06
58	06 15	07 03	07 47	20 12	21 28	22 46	24 02
S 60	06 19	07 09	07 57	20 01	21 19	22 39	23 58

Lat.	Sunset	Twilight Civil	Twilight Naut.	Moonset 7	Moonset 8	Moonset 9	Moonset 10
°	h m	h m	h m	h m	h m	h m	h m
N 72	□	□	□	■	06 11	08 20	10 15
N 70	22 12	////	////	05 13	06 59	08 47	10 31
68	21 32	////	////	05 57	07 29	09 07	10 44
66	21 05	22 57	////	06 26	07 52	09 23	10 54
64	20 45	22 06	////	06 48	08 10	09 36	11 03
62	20 28	21 35	////	07 06	08 24	09 47	11 10
60	20 15	21 13	23 03	07 20	08 37	09 56	11 16
N 58	20 03	20 55	22 17	07 33	08 47	10 05	11 22
56	19 53	20 40	21 49	07 44	08 56	10 12	11 27
54	19 44	20 28	21 28	07 53	09 05	10 18	11 31
52	19 36	20 17	21 11	08 02	09 12	10 24	11 35
50	19 29	20 07	20 57	08 09	09 18	10 29	11 39
45	19 14	19 47	20 29	08 25	09 32	10 40	11 46
N 40	19 01	19 31	20 08	08 38	09 44	10 49	11 53
35	18 51	19 18	19 52	08 50	09 54	10 57	11 58
30	18 42	19 07	19 38	08 59	10 02	11 04	12 03
20	18 26	18 49	19 17	09 16	10 17	11 16	12 12
N 10	18 12	18 35	19 00	09 31	10 30	11 26	12 19
0	18 00	18 22	18 47	09 44	10 42	11 35	12 26
S 10	17 47	18 09	18 35	09 58	10 54	11 45	12 33
20	17 34	17 57	18 24	10 12	11 06	11 55	12 40
30	17 19	17 44	18 13	10 29	11 21	12 06	12 48
35	17 11	17 37	18 08	10 38	11 29	12 13	12 52
40	17 01	17 30	18 02	10 49	11 38	12 21	12 58
45	16 50	17 21	17 56	11 02	11 49	12 29	13 04
S 50	16 36	17 11	17 49	11 18	12 03	12 40	13 11
52	16 29	17 06	17 47	11 25	12 09	12 44	13 14
54	16 22	17 01	17 44	11 33	12 15	12 50	13 18
56	16 14	16 55	17 40	11 42	12 23	12 56	13 22
58	16 05	16 49	17 37	11 52	12 32	13 02	13 26
S 60	15 55	16 43	17 33	12 04	12 41	13 09	13 31

Day	SUN Eqn. of Time 00ʰ	SUN Eqn. of Time 12ʰ	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
	m s	m s	h m	h m	h m	d	
7	03 29	03 31	11 56	03 30	16 00	19	◑
8	03 33	03 34	11 56	04 28	16 56	20	
9	03 36	03 38	11 56	05 23	17 49	21	

1977 MAY 10, 11, 12 (TUES., WED., THURS.)

G.M.T.		ARIES	VENUS −4.2		MARS +1.3		JUPITER −1.5		SATURN +0.5	
		G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
d	h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
10	00	227 40.8	217 44.2	N 4 57.6	218 29.5	N 2 40.4	161 35.4	N21 05.1	94 15.6	N18 30.0
	01	242 43.3	232 45.5	57.6	233 30.2	41.2	176 37.3	05.2	109 17.9	29.9
	02	257 45.7	247 46.8	57.6	248 30.9	41.9	191 39.1	05.3	124 20.3	29.9
	03	272 48.2	262 48.1	·· 57.7	263 31.6	·· 42.7	206 41.0	·· 05.4	139 22.6	·· 29.8
	04	287 50.7	277 49.4	57.7	278 32.3	43.4	221 42.9	05.5	154 24.9	29.8
	05	302 53.1	292 50.7	57.7	293 33.0	44.2	236 44.7	05.6	169 27.3	29.8
	06	317 55.6	307 52.0	N 4 57.8	308 33.7	N 2 45.0	251 46.6	N21 05.7	184 29.6	N18 29.7
	07	332 58.0	322 53.3	57.8	323 34.4	45.7	266 48.5	05.7	199 31.9	29.7
	08	348 00.5	337 54.6	57.8	338 35.1	46.5	281 50.3	05.8	214 34.3	29.7
	09	3 03.0	352 55.9	·· 57.9	353 35.8	·· 47.2	296 52.2	·· 05.9	229 36.6	·· 29.6
TUESDAY	10	18 05.4	7 57.2	57.9	8 36.5	48.0	311 54.0	06.0	244 39.0	29.6
	11	33 07.9	22 58.5	57.9	23 37.2	48.7	326 55.9	06.1	259 41.3	29.6
	12	48 10.4	37 59.8	N 4 58.0	38 38.0	N 2 49.5	341 57.8	N21 06.2	274 43.6	N18 29.5
	13	63 12.8	53 01.1	58.0	53 38.7	50.3	356 59.6	06.3	289 46.0	29.5
	14	78 15.3	68 02.3	58.1	68 39.4	51.0	12 01.5	06.4	304 48.3	29.5
	15	93 17.8	83 03.6	·· 58.1	83 40.1	·· 51.8	27 03.4	·· 06.5	319 50.6	·· 29.4
	16	108 20.2	98 04.9	58.2	98 40.8	52.5	42 05.2	06.6	334 53.0	29.4
	17	123 22.7	113 06.2	58.2	113 41.5	53.3	57 07.1	06.7	349 55.3	29.4
	18	138 25.2	128 07.4	N 4 58.3	128 42.2	N 2 54.0	72 09.0	N21 06.8	4 57.6	N18 29.3
	19	153 27.6	143 08.7	58.3	143 42.9	54.8	87 10.8	06.9	20 00.0	29.3
	20	168 30.1	158 10.0	58.4	158 43.6	55.6	102 12.7	07.0	35 02.3	29.2
	21	183 32.5	173 11.2	·· 58.4	173 44.3	·· 56.3	117 14.5	·· 07.1	50 04.6	·· 29.2
	22	198 35.0	188 12.5	58.5	188 45.0	57.1	132 16.4	07.2	65 07.0	29.2
	23	213 37.5	203 13.8	58.5	203 45.7	57.8	147 18.3	07.3	80 09.3	29.1
11	00	228 39.9	218 15.0	N 4 58.6	218 46.4	N 2 58.6	162 20.1	N21 07.4	95 11.6	N18 29.1
	01	243 42.4	233 16.3	58.7	233 47.1	2 59.4	177 22.0	07.5	110 14.0	29.1
	02	258 44.9	248 17.5	58.7	248 47.8	3 00.1	192 23.9	07.6	125 16.3	29.0
	03	273 47.3	263 18.8	·· 58.8	263 48.5	·· 00.9	207 25.7	·· 07.7	140 18.6	·· 29.0
	04	288 49.8	278 20.0	58.9	278 49.2	01.6	222 27.6	07.8	155 21.0	29.0
	05	303 52.3	293 21.3	58.9	293 49.9	02.4	237 29.4	07.9	170 23.3	28.9
	06	318 54.7	308 22.5	N 4 59.0	308 50.7	N 3 03.1	252 31.3	N21 08.0	185 25.6	N18 28.9
	07	333 57.2	323 23.8	59.1	323 51.4	03.9	267 33.2	08.0	200 28.0	28.8
	08	348 59.7	338 25.0	59.1	338 52.1	04.6	282 35.0	08.1	215 30.3	28.8
	09	4 02.1	353 26.2	·· 59.2	353 52.8	·· 05.4	297 36.9	·· 08.2	230 32.6	·· 28.8
	10	19 04.6	8 27.5	59.3	8 53.5	06.2	312 38.7	08.3	245 35.0	28.7
WEDNESDAY	11	34 07.0	23 28.7	59.4	23 54.2	06.9	327 40.6	08.4	260 37.3	28.7
	12	49 09.5	38 29.9	N 4 59.4	38 54.9	N 3 07.7	342 42.5	N21 08.5	275 39.6	N18 28.7
	13	64 12.0	53 31.2	59.5	53 55.6	08.4	357 44.3	08.6	290 42.0	28.6
	14	79 14.4	68 32.4	59.6	68 56.3	09.2	12 46.2	08.7	305 44.3	28.6
	15	94 16.9	83 33.6	·· 59.7	83 57.0	·· 09.9	27 48.1	·· 08.8	320 46.6	·· 28.6
	16	109 19.4	98 34.8	59.8	98 57.7	10.7	42 49.9	08.9	335 48.9	28.5
	17	124 21.8	113 36.1	59.9	113 58.4	11.5	57 51.8	09.0	350 51.3	28.5
	18	139 24.3	128 37.3	N 4 59.9	128 59.1	N 3 12.2	72 53.6	N21 09.1	5 53.6	N18 28.4
	19	154 26.8	143 38.5	5 00.0	143 59.8	13.0	87 55.5	09.2	20 55.9	28.4
	20	169 29.2	158 39.7	00.1	159 00.5	13.7	102 57.4	09.3	35 58.3	28.4
	21	184 31.7	173 40.9	·· 00.2	174 01.2	·· 14.5	117 59.2	·· 09.4	51 00.6	·· 28.3
	22	199 34.1	188 42.1	00.3	189 01.9	15.2	133 01.1	09.5	66 02.9	28.3
	23	214 36.6	203 43.3	00.4	204 02.6	16.0	148 02.9	09.6	81 05.3	28.3
12	00	229 39.1	218 44.5	N 5 00.5	219 03.4	N 3 16.7	163 04.8	N21 09.7	96 07.6	N18 28.2
	01	244 41.5	233 45.7	00.6	234 04.1	17.5	178 06.7	09.8	111 09.9	28.2
	02	259 44.0	248 46.9	00.7	249 04.8	18.3	193 08.5	09.9	126 12.2	28.2
	03	274 46.5	263 48.1	·· 00.8	264 05.5	·· 19.0	208 10.4	·· 09.9	141 14.6	·· 28.1
	04	289 48.9	278 49.3	00.9	279 06.2	19.8	223 12.2	10.0	156 16.9	28.1
	05	304 51.4	293 50.5	01.0	294 06.9	20.5	238 14.1	10.1	171 19.2	28.0
	06	319 53.9	308 51.7	N 5 01.1	309 07.6	N 3 21.3	253 16.0	N21 10.2	186 21.6	N18 28.0
	07	334 56.3	323 52.9	01.2	324 08.3	22.0	268 17.8	10.3	201 23.9	28.0
	08	349 58.8	338 54.1	01.3	339 09.0	22.8	283 19.7	10.4	216 26.2	27.9
	09	5 01.3	353 55.2	·· 01.4	354 09.7	·· 23.5	298 21.6	·· 10.5	231 28.5	·· 27.9
	10	20 03.7	8 56.4	01.5	9 10.4	24.3	313 23.4	10.6	246 30.9	27.9
THURSDAY	11	35 06.2	23 57.6	01.6	24 11.1	25.0	328 25.3	10.7	261 33.2	27.8
	12	50 08.6	38 58.8	N 5 01.8	39 11.8	N 3 25.8	343 27.1	N21 10.8	276 35.5	N18 27.8
	13	65 11.1	54 00.0	01.9	54 12.5	26.6	358 29.0	10.9	291 37.9	27.7
	14	80 13.6	69 01.1	02.0	69 13.2	27.3	13 30.9	11.0	306 40.2	27.7
	15	95 16.0	84 02.3	·· 02.1	84 13.9	·· 28.1	28 32.7	·· 11.1	321 42.5	·· 27.7
	16	110 18.5	99 03.5	02.2	99 14.6	28.8	43 34.6	11.2	336 44.8	27.6
	17	125 21.0	114 04.6	02.3	114 15.4	29.6	58 36.4	11.3	351 47.2	27.6
	18	140 23.4	129 05.8	N 5 02.5	129 16.1	N 3 30.3	73 38.3	N21 11.4	6 49.5	N18 27.6
	19	155 25.9	144 07.0	02.6	144 16.8	31.1	88 40.2	11.5	21 51.8	27.5
	20	170 28.4	159 08.1	02.7	159 17.5	31.8	103 42.0	11.6	36 54.1	27.5
	21	185 30.8	174 09.3	·· 02.8	174 18.2	·· 32.6	118 43.9	·· 11.6	51 56.5	·· 27.4
	22	200 33.3	189 10.4	03.0	189 18.9	33.3	133 45.7	11.7	66 58.8	27.4
	23	215 35.8	204 11.6	03.1	204 19.6	34.1	148 47.6	11.8	82 01.1	27.4
Mer. Pass.		h m 8 43.9	*v* 1.2	*d* 0.1	*v* 0.7	*d* 0.8	*v* 1.9	*d* 0.1	*v* 2.3	*d* 0.0

STARS

Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 39.4	S40 23.8
Achernar	335 47.6	S57 21.0
Acrux	173 39.1	S62 58.7
Adhara	255 34.1	S28 56.8
Aldebaran	291 20.9	N16 27.7
Alioth	166 44.1	N56 05.1
Alkaid	153 19.9	N49 25.6
Al Na'ir	28 17.9	S47 04.0
Alnilam	276 14.2	S 1 13.1
Alphard	218 22.8	S 8 33.8
Alphecca	126 33.7	N26 47.4
Alpheratz	358 11.9	N28 57.8
Altair	62 34.6	N 8 48.5
Ankaa	353 42.8	S42 25.6
Antares	112 59.3	S26 22.9
Arcturus	146 20.2	N19 18.0
Atria	108 25.0	S68 59.1
Avior	234 29.3	S59 26.6
Bellatrix	279 01.5	N 6 19.6
Betelgeuse	271 31.0	N 7 24.0
Canopus	264 08.6	S52 41.3
Capella	281 15.1	N45 58.5
Deneb	49 49.9	N45 11.8
Denebola	183 01.2	N14 41.9
Diphda	349 23.4	S18 06.6
Dubhe	194 24.8	N61 52.6
Elnath	278 47.3	N28 35.2
Eltanin	90 58.4	N51 29.4
Enif	34 13.8	N 9 46.2
Fomalhaut	15 54.1	S29 44.4
Gacrux	172 30.8	S56 59.5
Gienah	176 20.1	S17 25.2
Hadar	149 25.9	S60 16.0
Hamal	328 31.8	N23 21.2
Kaus Aust.	84 19.6	S34 23.6
Kochab	137 17.9	N74 15.0
Markab	14 05.5	N15 04.9
Menkar	314 43.8	N 3 59.9
Menkent	148 39.3	S36 15.7
Miaplacidus	221 45.4	S69 37.9
Mirfak	309 19.8	N49 46.8
Nunki	76 31.8	S26 19.4
Peacock	54 01.8	S56 48.2
Pollux	244 01.1	N28 04.8
Procyon	245 28.3	N 5 16.8
Rasalhague	96 31.4	N12 34.5
Regulus	208 12.4	N12 04.6
Rigel	281 38.5	S 8 13.8
Rigil Kent.	140 28.2	S60 44.5
Sabik	102 43.4	S15 41.8
Schedar	350 11.9	N56 24.6
Shaula	96 58.5	S37 05.2
Sirius	258 57.9	S16 41.4
Spica	158 59.6	S11 02.7
Suhail	223 12.5	S43 20.8
Vega	80 57.1	N38 45.6
Zuben'ubi	137 35.2	S15 56.9

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	349 35.1	9 26
Mars	350 06.5	9 24
Jupiter	293 40.2	13 09
Saturn	226 31.7	17 36

1977 MAY 10, 11, 12 (TUES., WED., THURS.)

	G.M.T.	SUN G.H.A.	SUN Dec.	MOON G.H.A.	MOON *v*	MOON Dec.	MOON *d*	MOON H.P.
	d h	° ′	° ′	° ′	′	° ′	′	′
	10 00	180 54.7	N17 31.9	269 38.1	10.7	S11 06.1	8.8	57.6
	01	195 54.8	32.5	284 07.8	10.7	10 57.3	8.9	57.6
	02	210 54.8	33.2	298 37.5	10.8	10 48.4	8.9	57.5
	03	225 54.8	·· 33.8	313 07.3	10.9	10 39.5	8.9	57.5
	04	240 54.8	34.5	327 37.2	11.0	10 30.6	9.0	57.5
	05	255 54.9	35.1	342 07.2	11.0	10 21.6	9.0	57.4
	06	270 54.9	N17 35.8	356 37.2	11.1	S10 12.6	9.0	57.4
	07	285 54.9	36.5	11 07.3	11.1	10 03.6	9.2	57.4
T	08	300 54.9	37.1	25 37.4	11.3	9 54.4	9.1	57.3
U	09	315 55.0	·· 37.8	40 07.7	11.3	9 45.3	9.2	57.3
E	10	330 55.0	38.4	54 38.0	11.3	9 36.1	9.2	57.3
S	11	345 55.0	39.1	69 08.3	11.4	9 26.9	9.3	57.2
D	12	0 55.0	N17 39.7	83 38.7	11.5	S 9 17.6	9.3	57.2
A	13	15 55.0	40.4	98 09.2	11.6	9 08.3	9.3	57.2
Y	14	30 55.1	41.0	112 39.8	11.6	8 59.0	9.4	57.1
	15	45 55.1	·· 41.7	127 10.4	11.7	8 49.6	9.4	57.1
	16	60 55.1	42.3	141 41.1	11.8	8 40.2	9.4	57.1
	17	75 55.1	43.0	156 11.9	11.8	8 30.8	9.4	57.0
	18	90 55.2	N17 43.6	170 42.7	11.8	S 8 21.4	9.5	57.0
	19	105 55.2	44.3	185 13.5	12.0	8 11.9	9.6	57.0
	20	120 55.2	44.9	199 44.5	12.0	8 02.3	9.5	56.9
	21	135 55.2	·· 45.6	214 15.5	12.0	7 52.8	9.6	56.9
	22	150 55.2	46.2	228 46.5	12.2	7 43.2	9.6	56.9
	23	165 55.3	46.9	243 17.7	12.1	7 33.6	9.7	56.8
	11 00	180 55.3	N17 47.5	257 48.8	12.3	S 7 23.9	9.6	56.8
	01	195 55.3	48.2	272 20.1	12.2	7 14.3	9.7	56.8
	02	210 55.3	48.8	286 51.3	12.4	7 04.6	9.7	56.7
	03	225 55.3	·· 49.4	301 22.7	12.4	6 54.9	9.8	56.7
	04	240 55.4	50.1	315 54.1	12.4	6 45.1	9.7	56.7
	05	255 55.4	50.7	330 25.5	12.5	6 35.4	9.8	56.6
	06	270 55.4	N17 51.4	344 57.0	12.6	S 6 25.6	9.8	56.6
W	07	285 55.4	52.0	359 28.6	12.6	6 15.8	9.8	56.6
E	08	300 55.4	52.7	14 00.2	12.7	6 06.0	9.8	56.6
D	09	315 55.4	·· 53.3	28 31.9	12.7	5 56.2	9.9	56.5
N	10	330 55.5	53.9	43 03.6	12.7	5 46.3	9.9	56.5
E	11	345 55.5	54.6	57 35.3	12.9	5 36.4	9.9	56.5
S	12	0 55.5	N17 55.2	72 07.2	12.8	S 5 26.5	9.9	56.4
D	13	15 55.5	55.9	86 39.0	12.9	5 16.6	9.9	56.4
A	14	30 55.5	56.5	101 10.9	13.0	5 06.7	9.9	56.4
Y	15	45 55.5	·· 57.1	115 42.9	13.0	4 56.8	10.0	56.3
	16	60 55.6	57.8	130 14.9	13.0	4 46.8	9.9	56.3
	17	75 55.6	58.4	144 46.9	13.1	4 36.9	10.0	56.3
	18	90 55.6	N17 59.1	159 19.0	13.1	S 4 26.9	10.0	56.3
	19	105 55.6	17 59.7	173 51.1	13.2	4 16.9	10.0	56.2
	20	120 55.6	18 00.3	188 23.3	13.2	4 06.9	10.0	56.2
	21	135 55.6	·· 01.0	202 55.5	13.3	3 56.9	10.0	56.2
	22	150 55.7	01.6	217 27.8	13.3	3 46.9	10.0	56.1
	23	165 55.7	02.2	232 00.1	13.3	3 36.9	10.0	56.1
	12 00	180 55.7	N18 02.9	246 32.4	13.4	S 3 26.9	10.1	56.1
	01	195 55.7	03.5	261 04.8	13.4	3 16.8	10.0	56.1
	02	210 55.7	04.1	275 37.2	13.5	3 06.8	10.1	56.0
	03	225 55.7	·· 04.8	290 09.7	13.5	2 56.7	10.0	56.0
	04	240 55.7	05.4	304 42.2	13.5	2 46.7	10.1	56.0
	05	255 55.7	06.0	319 14.7	13.5	2 36.6	10.0	55.9
	06	270 55.8	N18 06.7	333 47.2	13.6	S 2 26.6	10.1	55.9
	07	285 55.8	07.3	348 19.8	13.7	2 16.5	10.0	55.9
T	08	300 55.8	07.9	2 52.5	13.6	2 06.5	10.1	55.9
H	09	315 55.8	·· 08.5	17 25.1	13.7	1 56.4	10.0	55.8
U	10	330 55.8	09.2	31 57.8	13.7	1 46.4	10.1	55.8
R	11	345 55.8	09.8	46 30.5	13.8	1 36.3	10.1	55.8
S	12	0 55.8	N18 10.4	61 03.3	13.8	S 1 26.2	10.0	55.8
D	13	15 55.8	11.1	75 36.1	13.8	1 16.2	10.1	55.7
A	14	30 55.8	11.7	90 08.9	13.8	1 06.1	10.0	55.7
Y	15	45 55.9	·· 12.3	104 41.7	13.9	0 56.1	10.1	55.7
	16	60 55.9	12.9	119 14.6	13.9	0 46.0	10.0	55.7
	17	75 55.9	13.6	133 47.5	13.9	0 36.0	10.0	55.6
	18	90 55.9	N18 14.2	148 20.4	14.0	S 0 26.0	10.1	55.6
	19	105 55.9	14.8	162 53.4	13.9	0 15.9	10.0	55.6
	20	120 55.9	15.4	177 26.3	14.0	S 0 05.9	10.0	55.6
	21	135 55.9	·· 16.0	191 59.3	14.1	N 0 04.1	10.0	55.5
	22	150 55.9	16.7	206 32.4	14.0	0 14.1	10.0	55.5
	23	165 55.9	17.3	221 05.4	14.1	0 24.1	10.0	55.5
		S.D. 15.9	*d* 0.6	S.D. 15.6		15.4		15.2

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 10	Moonrise 11	Moonrise 12	Moonrise 13
°	h m	h m	h m	h m	h m	h m	h m
N 72	□	□	□	02 31	02 24	02 17	02 11
N 70	////	////	01 24	02 14	02 14	02 13	02 12
68	////	////	02 09	02 00	02 06	02 10	02 13
66	////	00 27	02 39	01 48	01 59	02 07	02 14
64	////	01 35	03 00	01 39	01 53	02 04	02 15
62	////	02 08	03 18	01 30	01 48	02 02	02 15
60	00 24	02 33	03 32	01 23	01 43	02 00	02 16
N 58	01 25	02 52	03 45	01 17	01 39	01 58	02 16
56	01 56	03 07	03 55	01 11	01 36	01 57	02 17
54	02 18	03 20	04 04	01 06	01 32	01 55	02 17
52	02 36	03 32	04 13	01 02	01 29	01 54	02 17
50	02 51	03 42	04 20	00 58	01 27	01 53	02 18
45	03 20	04 02	04 36	00 49	01 21	01 50	02 18
N 40	03 41	04 19	04 49	00 41	01 16	01 48	02 19
35	03 58	04 32	05 00	00 35	01 12	01 46	02 19
30	04 12	04 43	05 09	00 29	01 08	01 45	02 20
20	04 34	05 02	05 26	00 19	01 02	01 42	02 21
N 10	04 52	05 18	05 40	00 10	00 56	01 40	02 21
0	05 06	05 31	05 53	00 02	00 51	01 37	02 22
S 10	05 18	05 44	06 06	24 46	00 46	01 35	02 23
20	05 30	05 56	06 19	24 40	00 40	01 33	02 24
30	05 41	06 10	06 35	24 33	00 33	01 30	02 24
35	05 47	06 17	06 44	24 30	00 30	01 28	02 25
40	05 53	06 25	06 54	24 25	00 25	01 26	02 26
45	05 59	06 35	07 06	24 20	00 20	01 24	02 26
S 50	06 06	06 46	07 21	24 15	00 15	01 22	02 27
52	06 10	06 50	07 28	24 12	00 12	01 21	02 28
54	06 13	06 56	07 35	24 09	00 09	01 19	02 28
56	06 16	07 02	07 43	24 06	00 06	01 18	02 28
58	06 20	07 08	07 53	24 02	00 02	01 16	02 29
S 60	06 24	07 16	08 04	23 58	25 15	01 15	02 30

Lat.	Sunset	Twilight Civil	Twilight Naut.	Moonset 10	Moonset 11	Moonset 12	Moonset 13
°	h m	h m	h m	h m	h m	h m	h m
N 72	□	□	□	10 15	12 02	13 43	15 22
N 70	22 36	////	////	10 31	12 10	13 45	15 18
68	21 47	////	////	10 44	12 17	13 47	15 14
66	21 17	////	////	10 54	12 22	13 48	15 11
64	20 55	22 23	////	11 03	12 27	13 49	15 09
62	20 37	21 47	////	11 10	12 31	13 50	15 07
60	20 22	21 23	////	11 16	12 34	13 50	15 05
N 58	20 10	21 03	22 32	11 22	12 37	13 51	15 03
56	19 59	20 47	22 00	11 27	12 40	13 52	15 02
54	19 49	20 34	21 37	11 31	12 43	13 52	15 00
52	19 41	20 22	21 18	11 35	12 45	13 53	14 59
50	19 33	20 12	21 03	11 39	12 47	13 53	14 58
45	19 17	19 51	20 34	11 46	12 51	13 54	14 56
N 40	19 04	19 35	20 12	11 53	12 55	13 55	14 54
35	18 53	19 21	19 55	11 58	12 58	13 56	14 52
30	18 44	19 10	19 41	12 03	13 01	13 56	14 50
20	18 27	18 51	19 18	12 12	13 05	13 57	14 48
N 10	18 13	18 35	19 01	12 19	13 10	13 58	14 46
0	18 00	18 22	18 47	12 26	13 13	13 59	14 43
S 10	17 47	18 09	18 34	12 33	13 17	14 00	14 41
20	17 33	17 56	18 23	12 40	13 21	14 01	14 39
30	17 17	17 42	18 11	12 48	13 26	14 01	14 36
35	17 08	17 35	18 05	12 52	13 28	14 02	14 35
40	16 58	17 27	17 59	12 58	13 31	14 03	14 33
45	16 46	17 17	17 53	13 04	13 35	14 03	14 31
S 50	16 31	17 06	17 46	13 11	13 39	14 04	14 29
52	16 24	17 02	17 42	13 14	13 40	14 04	14 27
54	16 17	16 56	17 39	13 18	13 42	14 05	14 26
56	16 08	16 50	17 36	13 22	13 45	14 05	14 25
58	15 59	16 44	17 32	13 26	13 47	14 06	14 24
S 60	15 48	16 36	17 28	13 31	13 50	14 06	14 22

Day	SUN Eqn. of Time 00ʰ	SUN Eqn. of Time 12ʰ	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
	m s	m s	h m	h m	h m	d	
10	03 39	03 40	11 56	06 14	18 38	22	◐
11	03 41	03 42	11 56	07 02	19 25	23	
12	03 43	03 43	11 56	07 48	20 11	24	

1977 MAY 13, 14, 15 (FRI., SAT., SUN.)

G.M.T.	ARIES	VENUS −4.2		MARS +1.3		JUPITER −1.5		SATURN +0.5	
	G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
d h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
13 00	230 38.2	219 12.7	N 5 03.2	219 20.3	N 3 34.8	163 49.5	N21 11.9	97 03.5	N18 27.3
01	245 40.7	234 13.9	03.4	234 21.0	35.6	178 51.3	12.0	112 05.8	27.3
02	260 43.1	249 15.0	03.5	249 21.7	36.4	193 53.2	12.1	127 08.1	27.2
03	275 45.6	264 16.2	·· 03.6	264 22.4	·· 37.1	208 55.0	·· 12.2	142 10.4	·· 27.2
04	290 48.1	279 17.3	03.8	279 23.1	37.9	223 56.9	12.3	157 12.8	27.2
05	305 50.5	294 18.4	03.9	294 23.8	38.6	238 58.7	12.4	172 15.1	27.1
06	320 53.0	309 19.6	N 5 04.0	309 24.5	N 3 39.4	254 00.6	N21 12.5	187 17.4	N18 27.1
07	335 55.5	324 20.7	04.2	324 25.2	40.1	269 02.5	12.6	202 19.7	27.1
08	350 57.9	339 21.8	04.3	339 25.9	40.9	284 04.3	12.7	217 22.0	27.0
F 09	6 00.4	354 23.0	·· 04.5	354 26.7	·· 41.6	299 06.2	·· 12.8	232 24.4	·· 27.0
R 10	21 02.9	9 24.1	04.6	9 27.4	42.4	314 08.0	12.9	247 26.7	26.9
I 11	36 05.3	24 25.2	04.8	24 28.1	43.1	329 09.9	13.0	262 29.0	26.9
D 12	51 07.8	39 26.4	N 5 04.9	39 28.8	N 3 43.9	344 11.8	N21 13.1	277 31.3	N18 26.9
A 13	66 10.2	54 27.5	05.0	54 29.5	44.6	359 13.6	13.2	292 33.7	26.8
Y 14	81 12.7	69 28.6	05.2	69 30.2	45.4	14 15.5	13.2	307 36.0	26.8
15	96 15.2	84 29.7	·· 05.4	84 30.9	·· 46.1	29 17.3	·· 13.3	322 38.3	·· 26.7
16	111 17.6	99 30.8	05.5	99 31.6	46.9	44 19.2	13.4	337 40.6	26.7
17	126 20.1	114 31.9	05.7	114 32.3	47.6	59 21.1	13.5	352 43.0	26.7
18	141 22.6	129 33.1	N 5 05.8	129 33.0	N 3 48.4	74 22.9	N21 13.6	7 45.3	N18 26.6
19	156 25.0	144 34.2	06.0	144 33.7	49.1	89 24.8	13.7	22 47.6	26.6
20	171 27.5	159 35.3	06.1	159 34.4	49.9	104 26.6	13.8	37 49.9	26.6
21	186 30.0	174 36.4	·· 06.3	174 35.1	·· 50.6	119 28.5	·· 13.9	52 52.2	·· 26.5
22	201 32.4	189 37.5	06.4	189 35.8	51.4	134 30.3	14.0	67 54.6	26.5
23	216 34.9	204 38.6	06.6	204 36.5	52.1	149 32.2	14.1	82 56.9	26.4
14 00	231 37.4	219 39.7	N 5 06.8	219 37.2	N 3 52.9	164 34.1	N21 14.2	97 59.2	N18 26.4
01	246 39.8	234 40.8	06.9	234 38.0	53.7	179 35.9	14.3	113 01.5	26.4
02	261 42.3	249 41.9	07.1	249 38.7	54.4	194 37.8	14.4	128 03.9	26.3
03	276 44.7	264 43.0	·· 07.3	264 39.4	·· 55.2	209 39.6	·· 14.5	143 06.2	·· 26.3
04	291 47.2	279 44.1	07.4	279 40.1	55.9	224 41.5	14.6	158 08.5	26.2
05	306 49.7	294 45.1	07.6	294 40.8	56.7	239 43.4	14.6	173 10.8	26.2
06	321 52.1	309 46.2	N 5 07.8	309 41.5	N 3 57.4	254 45.2	N21 14.7	188 13.1	N18 26.2
07	336 54.6	324 47.3	08.0	324 42.2	58.2	269 47.1	14.8	203 15.5	26.1
S 08	351 57.1	339 48.4	08.1	339 42.9	58.9	284 48.9	14.9	218 17.8	26.1
A 09	6 59.5	354 49.5	·· 08.3	354 43.6	3 59.7	299 50.8	·· 15.0	233 20.1	·· 26.0
T 10	22 02.0	9 50.6	08.5	9 44.3	4 00.4	314 52.6	15.1	248 22.4	26.0
U 11	37 04.5	24 51.6	08.7	24 45.0	01.2	329 54.5	15.2	263 24.7	26.0
R 12	52 06.9	39 52.7	N 5 08.8	39 45.7	N 4 01.9	344 56.4	N21 15.3	278 27.1	N18 25.9
D 13	67 09.4	54 53.8	09.0	54 46.4	02.7	359 58.2	15.4	293 29.4	25.9
A 14	82 11.9	69 54.9	09.2	69 47.1	03.4	15 00.1	15.5	308 31.7	25.8
Y 15	97 14.3	84 55.9	·· 09.4	84 47.8	·· 04.2	30 01.9	·· 15.6	323 34.0	·· 25.8
16	112 16.8	99 57.0	09.6	99 48.5	04.9	45 03.8	15.7	338 36.3	25.8
17	127 19.2	114 58.1	09.8	114 49.3	05.7	60 05.6	15.8	353 38.7	25.7
18	142 21.7	129 59.1	N 5 10.0	129 50.0	N 4 06.4	75 07.5	N21 15.9	8 41.0	N18 25.7
19	157 24.2	145 00.2	10.1	144 50.7	07.2	90 09.4	15.9	23 43.3	25.6
20	172 26.6	160 01.2	10.3	159 51.4	07.9	105 11.2	16.0	38 45.6	25.6
21	187 29.1	175 02.3	·· 10.5	174 52.1	·· 08.7	120 13.1	·· 16.1	53 47.9	·· 25.6
22	202 31.6	190 03.3	10.7	189 52.8	09.4	135 14.9	16.2	68 50.3	25.5
23	217 34.0	205 04.4	10.9	204 53.5	10.1	150 16.8	16.3	83 52.6	25.5
15 00	232 36.5	220 05.4	N 5 11.1	219 54.2	N 4 10.9	165 18.6	N21 16.4	98 54.9	N18 25.4
01	247 39.0	235 06.5	11.3	234 54.9	11.6	180 20.5	16.5	113 57.2	25.4
02	262 41.4	250 07.5	11.5	249 55.6	12.4	195 22.4	16.6	128 59.5	25.4
03	277 43.9	265 08.6	·· 11.7	264 56.3	·· 13.1	210 24.2	·· 16.7	144 01.8	·· 25.3
04	292 46.3	280 09.6	11.9	279 57.0	13.9	225 26.1	16.8	159 04.2	25.3
05	307 48.8	295 10.7	12.1	294 57.7	14.6	240 27.9	16.9	174 06.5	25.2
06	322 51.3	310 11.7	N 5 12.3	309 58.4	N 4 15.4	255 29.8	N21 17.0	189 08.8	N18 25.2
07	337 53.7	325 12.7	12.5	324 59.1	16.1	270 31.6	17.1	204 11.1	25.2
08	352 56.2	340 13.8	12.7	339 59.9	16.9	285 33.5	17.2	219 13.4	25.1
S 09	7 58.7	355 14.8	·· 12.9	355 00.6	·· 17.6	300 35.4	·· 17.2	234 15.7	·· 25.1
U 10	23 01.1	10 15.8	13.1	10 01.3	18.4	315 37.2	17.3	249 18.1	25.0
N 11	38 03.6	25 16.9	13.3	25 02.0	19.1	330 39.1	17.4	264 20.4	25.0
D 12	53 06.1	40 17.9	N 5 13.6	40 02.7	N 4 19.9	345 40.9	N21 17.5	279 22.7	N18 25.0
A 13	68 08.5	55 18.9	13.8	55 03.4	20.6	0 42.8	17.6	294 25.0	24.9
Y 14	83 11.0	70 19.9	14.0	70 04.1	21.4	15 44.6	17.7	309 27.3	24.9
15	98 13.5	85 21.0	·· 14.2	85 04.8	·· 22.1	30 46.5	·· 17.8	324 29.6	·· 24.8
16	113 15.9	100 22.0	14.4	100 05.5	22.9	45 48.3	17.9	339 31.9	24.8
17	128 18.4	115 23.0	14.6	115 06.2	23.6	60 50.2	18.0	354 34.3	24.7
18	143 20.8	130 24.0	N 5 14.9	130 06.9	N 4 24.4	75 52.1	N21 18.1	9 36.6	N18 24.7
19	158 23.3	145 25.0	15.1	145 07.6	25.1	90 53.9	18.2	24 38.9	24.7
20	173 25.8	160 26.0	15.3	160 08.3	25.9	105 55.8	18.3	39 41.2	24.6
21	188 28.2	175 27.0	·· 15.5	175 09.0	·· 26.6	120 57.6	·· 18.3	54 43.5	·· 24.6
22	203 30.7	190 28.1	15.7	190 09.7	27.3	135 59.5	18.4	69 45.8	24.5
23	218 33.2	205 29.1	16.0	205 10.4	28.1	151 01.3	18.5	84 48.2	24.5
Mer. Pass.	h m 8 32.1	v 1.1	d 0.2	v 0.7	d 0.7	v 1.9	d 0.1	v 2.3	d 0.0

STARS

Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 39.4	S40 23.8
Achernar	335 47.6	S57 21.0
Acrux	173 39.2	S62 58.7
Adhara	255 34.1	S28 56.8
Aldebaran	291 20.9	N16 27.7
Alioth	166 44.2	N56 05.1
Alkaid	153 19.9	N49 25.7
Al Na'ir	28 17.9	S47 04.0
Alnilam	276 14.3	S 1 13.1
Alphard	218 22.8	S 8 33.8
Alphecca	126 33.7	N26 47.4
Alpheratz	358 11.9	N28 57.8
Altair	62 34.6	N 8 48.5
Ankaa	353 42.8	S42 25.6
Antares	112 59.3	S26 22.9
Arcturus	146 20.2	N19 18.0
Atria	108 25.0	S68 59.1
Avior	234 29.3	S59 26.6
Bellatrix	279 01.5	N 6 19.6
Betelgeuse	271 31.0	N 7 24.0
Canopus	264 08.6	S52 41.3
Capella	281 15.1	N45 58.5
Deneb	49 49.8	N45 11.8
Denebola	183 01.2	N14 41.9
Diphda	349 23.4	S18 06.6
Dubhe	194 24.8	N61 52.6
Elnath	278 47.3	N28 35.2
Eltanin	90 58.3	N51 29.4
Enif	34 13.8	N 9 46.2
Fomalhaut	15 54.1	S29 44.4
Gacrux	172 30.8	S56 59.5
Gienah	176 20.1	S17 25.2
Hadar	149 25.9	S60 16.0
Hamal	328 31.8	N23 21.2
Kaus Aust.	84 19.5	S34 23.6
Kochab	137 17.9	N74 15.0
Markab	14 05.5	N15 04.9
Menkar	314 43.8	N 3 59.9
Menkent	148 39.3	S36 15.7
Miaplacidus	221 45.4	S69 37.9
Mirfak	309 19.8	N49 46.8
Nunki	76 31.7	S26 19.4
Peacock	54 01.8	S56 48.2
Pollux	244 01.1	N28 04.8
Procyon	245 28.3	N 5 16.8
Rasalhague	96 31.4	N12 34.6
Regulus	208 12.4	N12 04.6
Rigel	281 38.5	S 8 13.8
Rigil Kent.	140 28.2	S60 44.6
Sabik	102 43.4	S15 41.8
Schedar	350 11.9	N56 24.6
Shaula	96 58.5	S37 05.2
Sirius	258 57.9	S16 41.4
Spica	158 59.6	S11 02.7
Suhail	223 12.5	S43 20.8
Vega	80 57.1	N38 45.7
Zuben'ubi	137 35.2	S15 56.9

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	348 02.3	9 21
Mars	347 59.9	9 21
Jupiter	292 56.7	13 00
Saturn	226 21.9	17 25

G.M.T.	SUN G.H.A.	SUN Dec.	MOON G.H.A.	*v*	MOON Dec.	*d*	H.P.
d h	° ′	° ′	° ′	′	° ′	′	′
13 00	180 55.9	N18 17.9	235 38.5	14.0	N 0 34.1	10.0	55.5
01	195 55.9	18.5	250 11.5	14.1	0 44.1	9.9	55.4
02	210 56.0	19.2	264 44.6	14.2	0 54.0	10.0	55.4
03	225 56.0	·· 19.8	279 17.8	14.1	1 04.0	9.9	55.4
04	240 56.0	20.4	293 50.9	14.2	1 13.9	10.0	55.4
05	255 56.0	21.0	308 24.1	14.1	1 23.9	9.9	55.4
06	270 56.0	N18 21.6	322 57.2	14.2	N 1 33.8	9.9	55.3
07	285 56.0	22.2	337 30.4	14.2	1 43.7	9.9	55.3
08	300 56.0	22.9	352 03.6	14.3	1 53.6	9.8	55.3
F 09	315 56.0	·· 23.5	6 36.9	14.2	2 03.4	9.9	55.3
R 10	330 56.0	24.1	21 10.1	14.2	2 13.3	9.9	55.2
I 11	345 56.0	24.7	35 43.3	14.3	2 23.2	9.8	55.2
D 12	0 56.0	N18 25.3	50 16.6	14.3	N 2 33.0	9.8	55.2
A 13	15 56.0	25.9	64 49.9	14.3	2 42.8	9.8	55.2
Y 14	30 56.0	26.6	79 23.2	14.3	2 52.6	9.7	55.2
15	45 56.0	·· 27.2	93 56.5	14.3	3 02.3	9.8	55.1
16	60 56.0	27.8	108 29.8	14.3	3 12.1	9.7	55.1
17	75 56.0	28.4	123 03.1	14.3	3 21.8	9.7	55.1
18	90 56.0	N18 29.0	137 36.4	14.4	N 3 31.5	9.7	55.1
19	105 56.0	29.6	152 09.8	14.3	3 41.2	9.7	55.1
20	120 56.0	30.2	166 43.1	14.4	3 50.9	9.6	55.0
21	135 56.0	·· 30.8	181 16.5	14.3	4 00.5	9.7	55.0
22	150 56.0	31.4	195 49.8	14.4	4 10.2	9.6	55.0
23	165 56.0	32.0	210 23.2	14.4	4 19.8	9.5	55.0
14 00	180 56.0	N18 32.7	224 56.6	14.3	N 4 29.3	9.6	55.0
01	195 56.0	33.3	239 29.9	14.4	4 38.9	9.5	54.9
02	210 56.0	33.9	254 03.3	14.4	4 48.4	9.5	54.9
03	225 56.0	·· 34.5	268 36.7	14.4	4 57.9	9.5	54.9
04	240 56.0	35.1	283 10.1	14.4	5 07.4	9.4	54.9
05	255 56.0	35.7	297 43.5	14.4	5 16.8	9.5	54.9
06	270 56.0	N18 36.3	312 16.9	14.4	N 5 26.3	9.3	54.9
07	285 56.0	36.9	326 50.3	14.4	5 35.6	9.4	54.8
S 08	300 56.0	37.5	341 23.7	14.3	5 45.0	9.3	54.8
A 09	315 56.0	·· 38.1	355 57.0	14.4	5 54.3	9.3	54.8
T 10	330 56.0	38.7	10 30.4	14.4	6 03.6	9.3	54.8
U 11	345 56.0	39.3	25 03.8	14.4	6 12.9	9.3	54.8
R 12	0 56.0	N18 39.9	39 37.2	14.4	N 6 22.2	9.2	54.8
D 13	15 56.0	40.5	54 10.6	14.4	6 31.4	9.1	54.7
A 14	30 56.0	41.1	68 44.0	14.4	6 40.5	9.2	54.7
Y 15	45 56.0	·· 41.7	83 17.4	14.3	6 49.7	9.1	54.7
16	60 56.0	42.3	97 50.7	14.4	6 58.8	9.1	54.7
17	75 56.0	42.9	112 24.1	14.4	7 07.9	9.0	54.7
18	90 56.0	N18 43.5	126 57.5	14.3	N 7 16.9	9.0	54.7
19	105 56.0	44.1	141 30.8	14.4	7 25.9	9.0	54.6
20	120 56.0	44.7	156 04.2	14.3	7 34.9	8.9	54.6
21	135 56.0	·· 45.3	170 37.5	14.4	7 43.8	8.9	54.6
22	150 56.0	45.9	185 10.9	14.3	7 52.7	8.9	54.6
23	165 56.0	46.5	199 44.2	14.3	8 01.6	8.8	54.6
15 00	180 56.0	N18 47.1	214 17.5	14.4	N 8 10.4	8.8	54.6
01	195 56.0	47.7	228 50.9	14.3	8 19.2	8.7	54.6
02	210 56.0	48.3	243 24.2	14.3	8 27.9	8.7	54.5
03	225 56.0	·· 48.9	257 57.5	14.3	8 36.6	8.7	54.5
04	240 56.0	49.5	272 30.8	14.2	8 45.3	8.6	54.5
05	255 56.0	50.1	287 04.0	14.3	8 53.9	8.6	54.5
06	270 56.0	N18 50.6	301 37.3	14.3	N 9 02.5	8.5	54.5
07	285 56.0	51.2	316 10.6	14.2	9 11.0	8.5	54.5
08	300 56.0	51.8	330 43.8	14.2	9 19.5	8.5	54.5
S 09	315 56.0	·· 52.4	345 17.0	14.3	9 28.0	8.4	54.4
U 10	330 55.9	53.0	359 50.3	14.2	9 36.4	8.4	54.4
N 11	345 55.9	53.6	14 23.5	14.2	9 44.8	8.3	54.4
D 12	0 55.9	N18 54.2	28 56.7	14.1	N 9 53.1	8.3	54.4
A 13	15 55.9	54.8	43 29.8	14.2	10 01.4	8.2	54.4
Y 14	30 55.9	55.4	58 03.0	14.2	10 09.6	8.2	54.4
15	45 55.9	·· 55.9	72 36.2	14.1	10 17.8	8.1	54.4
16	60 55.9	56.5	87 09.3	14.1	10 25.9	8.1	54.4
17	75 55.9	57.1	101 42.4	14.1	10 34.0	8.1	54.3
18	90 55.9	N18 57.7	116 15.5	14.1	N10 42.1	8.0	54.3
19	105 55.9	58.3	130 48.6	14.1	10 50.1	7.9	54.3
20	120 55.9	58.9	145 21.7	14.1	10 58.0	7.9	54.3
21	135 55.9	18 59.5	159 54.8	14.0	11 05.9	7.9	54.3
22	150 55.8	19 00.0	174 27.8	14.1	11 13.8	7.7	54.3
23	165 55.8	00.6	189 00.9	14.0	11 21.5	7.8	54.3
	S.D. 15.8	*d* 0.6	S.D. 15.0		14.9		14.8

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 13	Moonrise 14	Moonrise 15	Moonrise 16
°	h m	h m	h m	h m	h m	h m	h m
N 72	▭	▭	▭	02 11	02 05	01 59	01 52
N 70	////	////	00 55	02 12	02 12	02 11	02 11
68	////	////	01 53	02 13	02 17	02 21	02 27
66	////	////	02 27	02 14	02 21	02 29	02 39
64	////	01 16	02 51	02 15	02 25	02 37	02 50
62	////	01 56	03 10	02 15	02 29	02 43	02 59
60	////	02 23	03 25	02 16	02 31	02 48	03 07
N 58	01 08	02 43	03 38	02 16	02 34	02 53	03 13
56	01 45	03 00	03 49	02 17	02 36	02 57	03 20
54	02 10	03 14	03 59	02 17	02 38	03 01	03 25
52	02 29	03 26	04 08	02 17	02 40	03 04	03 30
50	02 45	03 37	04 16	02 18	02 42	03 07	03 34
45	03 15	03 58	04 32	02 18	02 46	03 14	03 44
N 40	03 38	04 15	04 46	02 19	02 49	03 20	03 52
35	03 55	04 29	04 57	02 19	02 52	03 25	03 59
30	04 10	04 41	05 07	02 20	02 54	03 29	04 05
20	04 33	05 01	05 24	02 21	02 59	03 37	04 16
N 10	04 51	05 17	05 39	02 21	03 03	03 44	04 25
0	05 06	05 31	05 53	02 22	03 06	03 50	04 34
S 10	05 19	05 44	06 06	02 23	03 10	03 56	04 43
20	05 31	05 57	06 21	02 24	03 14	04 03	04 53
30	05 43	06 12	06 37	02 24	03 18	04 11	05 04
35	05 49	06 19	06 46	02 25	03 21	04 16	05 10
40	05 55	06 28	06 57	02 26	03 24	04 21	05 17
45	06 02	06 38	07 10	02 26	03 27	04 27	05 26
S 50	06 10	06 49	07 25	02 27	03 31	04 34	05 36
52	06 13	06 55	07 32	02 28	03 33	04 38	05 41
54	06 17	07 00	07 40	02 28	03 35	04 41	05 46
56	06 21	07 07	07 49	02 28	03 38	04 45	05 52
58	06 25	07 14	07 59	02 29	03 40	04 50	05 59
S 60	06 29	07 21	08 11	02 30	03 43	04 55	06 06

Lat.	Sunset	Twilight Civil	Twilight Naut.	Moonset 13	Moonset 14	Moonset 15	Moonset 16
°	h m	h m	h m	h m	h m	h m	h m
N 72	▭	▭	▭	15 22	17 00	18 38	20 19
N 70	23 09	////	////	15 18	16 49	18 20	19 51
68	22 04	////	////	15 14	16 40	18 06	19 30
66	21 29	////	////	15 11	16 33	17 54	19 13
64	21 04	22 43	////	15 09	16 27	17 44	19 00
62	20 45	22 00	////	15 07	16 22	17 36	18 49
60	20 29	21 32	////	15 05	16 18	17 29	18 39
N 58	20 16	21 11	22 50	15 03	16 14	17 23	18 30
56	20 04	20 54	22 11	15 02	16 10	17 17	18 23
54	19 54	20 40	21 45	15 00	16 07	17 13	18 17
52	19 46	20 28	21 26	14 59	16 04	17 08	18 11
50	19 38	20 17	21 09	14 58	16 02	17 04	18 05
45	19 21	19 55	20 38	14 56	15 56	16 55	17 54
N 40	19 07	19 38	20 16	14 54	15 51	16 48	17 44
35	18 56	19 24	19 58	14 52	15 47	16 42	17 36
30	18 46	19 12	19 43	14 50	15 44	16 37	17 29
20	18 28	18 52	19 20	14 48	15 38	16 27	17 17
N 10	18 14	18 36	19 02	14 46	15 32	16 19	17 06
0	18 00	18 22	18 47	14 43	15 27	16 11	16 56
S 10	17 46	18 08	18 34	14 41	15 22	16 04	16 46
20	17 32	17 55	18 22	14 39	15 17	15 55	16 35
30	17 15	17 41	18 10	14 36	15 11	15 46	16 23
35	17 06	17 33	18 03	14 35	15 07	15 41	16 16
40	16 55	17 24	17 57	14 33	15 03	15 35	16 08
45	16 42	17 14	17 50	14 31	14 59	15 28	15 59
S 50	16 27	17 03	17 42	14 29	14 53	15 19	15 48
52	16 20	16 57	17 39	14 27	14 51	15 15	15 43
54	16 12	16 52	17 35	14 26	14 48	15 11	15 37
56	16 03	16 45	17 31	14 25	14 45	15 06	15 31
58	15 53	16 38	17 27	14 24	14 42	15 01	15 23
S 60	15 41	16 30	17 22	14 22	14 38	14 55	15 15

Day	SUN Eqn. of Time 00ʰ	SUN Eqn. of Time 12ʰ	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
	m s	m s	h m	h m	h m	d	
13	03 44	03 44	11 56	08 33	20 55	25	◐
14	03 44	03 44	11 56	09 17	21 39	26	
15	03 44	03 44	11 56	10 01	22 23	27	

1977 MAY 16, 17, 18 (MON., TUES., WED.)

G.M.T.	ARIES	VENUS −4.2		MARS +1.3		JUPITER −1.5		SATURN +0.6	
	G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
d h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
16 00	233 35.6	220 30.1	N 5 16.2	220 11.2	N 4 28.8	166 03.2	N21 18.6	99 50.5	N18 24.5
01	248 38.1	235 31.1	16.4	235 11.9	29.6	181 05.0	18.7	114 52.8	24.4
02	263 40.6	250 32.1	16.7	250 12.6	30.3	196 06.9	18.8	129 55.1	24.4
03	278 43.0	265 33.1	·· 16.9	265 13.3	·· 31.1	211 08.8	·· 18.9	144 57.4	·· 24.3
04	293 45.5	280 34.1	17.1	280 14.0	31.8	226 10.6	19.0	159 59.7	24.3
05	308 48.0	295 35.1	17.4	295 14.7	32.6	241 12.5	19.1	175 02.0	24.3
06	323 50.4	310 36.0	N 5 17.6	310 15.4	N 4 33.3	256 14.3	N21 19.2	190 04.3	N18 24.2
07	338 52.9	325 37.0	17.8	325 16.1	34.1	271 16.2	19.3	205 06.7	24.2
08	353 55.3	340 38.0	18.1	340 16.8	34.8	286 18.0	19.4	220 09.0	24.1
M 09	8 57.8	355 39.0	·· 18.3	355 17.5	·· 35.6	301 19.9	·· 19.4	235 11.3	·· 24.1
O 10	24 00.3	10 40.0	18.5	10 18.2	36.3	316 21.7	19.5	250 13.6	24.0
N 11	39 02.7	25 41.0	18.8	25 18.9	37.0	331 23.6	19.6	265 15.9	24.0
D 12	54 05.2	40 42.0	N 5 19.0	40 19.6	N 4 37.8	346 25.5	N21 19.7	280 18.2	N18 24.0
A 13	69 07.7	55 42.9	19.3	55 20.3	38.5	1 27.3	19.8	295 20.5	23.9
Y 14	84 10.1	70 43.9	19.5	70 21.0	39.3	16 29.2	19.9	310 22.8	23.9
15	99 12.6	85 44.9	·· 19.8	85 21.8	·· 40.0	31 31.0	·· 20.0	325 25.2	·· 23.8
16	114 15.1	100 45.9	20.0	100 22.5	40.8	46 32.9	20.1	340 27.5	23.8
17	129 17.5	115 46.8	20.2	115 23.2	41.5	61 34.7	20.2	355 29.8	23.7
18	144 20.0	130 47.8	N 5 20.5	130 23.9	N 4 42.3	76 36.6	N21 20.3	10 32.1	N18 23.7
19	159 22.4	145 48.8	20.7	145 24.6	43.0	91 38.4	20.4	25 34.4	23.7
20	174 24.9	160 49.7	21.0	160 25.3	43.7	106 40.3	20.5	40 36.7	23.6
21	189 27.4	175 50.7	·· 21.3	175 26.0	·· 44.5	121 42.2	·· 20.5	55 39.0	·· 23.6
22	204 29.8	190 51.7	21.5	190 26.7	45.2	136 44.0	20.6	70 41.3	23.5
23	219 32.3	205 52.6	21.8	205 27.4	46.0	151 45.9	20.7	85 43.6	23.5
17 00	234 34.8	220 53.6	N 5 22.0	220 28.1	N 4 46.7	166 47.7	N21 20.8	100 46.0	N18 23.5
01	249 37.2	235 54.5	22.3	235 28.8	47.5	181 49.6	20.9	115 48.3	23.4
02	264 39.7	250 55.5	22.5	250 29.5	48.2	196 51.4	21.0	130 50.6	23.4
03	279 42.2	265 56.4	·· 22.8	265 30.2	·· 49.0	211 53.3	·· 21.1	145 52.9	·· 23.3
04	294 44.6	280 57.4	23.1	280 30.9	49.7	226 55.1	21.2	160 55.2	23.3
05	309 47.1	295 58.3	23.3	295 31.6	50.4	241 57.0	21.3	175 57.5	23.2
06	324 49.6	310 59.3	N 5 23.6	310 32.4	N 4 51.2	256 58.8	N21 21.4	190 59.8	N18 23.2
07	339 52.0	326 00.2	23.9	325 33.1	51.9	272 00.7	21.4	206 02.1	23.2
T 08	354 54.5	341 01.2	24.1	340 33.8	52.7	287 02.5	21.5	221 04.4	23.1
U 09	9 56.9	356 02.1	·· 24.4	355 34.5	·· 53.4	302 04.4	·· 21.6	236 06.7	·· 23.1
E 10	24 59.4	11 03.1	24.7	10 35.2	54.2	317 06.3	21.7	251 09.0	23.0
S 11	40 01.9	26 04.0	24.9	25 35.9	54.9	332 08.1	21.8	266 11.4	23.0
D 12	55 04.3	41 04.9	N 5 25.2	40 36.6	N 4 55.6	347 10.0	N21 21.9	281 13.7	N18 22.9
A 13	70 06.8	56 05.9	25.5	55 37.3	56.4	2 11.8	22.0	296 16.0	22.9
Y 14	85 09.3	71 06.8	25.7	70 38.0	57.1	17 13.7	22.1	311 18.3	22.9
15	100 11.7	86 07.7	·· 26.0	85 38.7	·· 57.9	32 15.5	·· 22.2	326 20.6	·· 22.8
16	115 14.2	101 08.7	26.3	100 39.4	58.6	47 17.4	22.3	341 22.9	22.8
17	130 16.7	116 09.6	26.6	115 40.1	4 59.3	62 19.2	22.4	356 25.2	22.7
18	145 19.1	131 10.5	N 5 26.8	130 40.8	N 5 00.1	77 21.1	N21 22.4	11 27.5	N18 22.7
19	160 21.6	146 11.4	27.1	145 41.5	00.8	92 22.9	22.5	26 29.8	22.6
20	175 24.1	161 12.4	27.4	160 42.2	01.6	107 24.8	22.6	41 32.1	22.6
21	190 26.5	176 13.3	·· 27.7	175 43.0	·· 02.3	122 26.6	·· 22.7	56 34.4	·· 22.5
22	205 29.0	191 14.2	28.0	190 43.7	03.1	137 28.5	22.8	71 36.7	22.5
23	220 31.4	206 15.1	28.3	205 44.4	03.8	152 30.4	22.9	86 39.0	22.5
18 00	235 33.9	221 16.0	N 5 28.5	220 45.1	N 5 04.5	167 32.2	N21 23.0	101 41.4	N18 22.4
01	250 36.4	236 17.0	28.8	235 45.8	05.3	182 34.1	23.1	116 43.7	22.4
02	265 38.8	251 17.9	29.1	250 46.5	06.0	197 35.9	23.2	131 46.0	22.3
03	280 41.3	266 18.8	·· 29.4	265 47.2	·· 06.8	212 37.8	·· 23.3	146 48.3	·· 22.3
04	295 43.8	281 19.7	29.7	280 47.9	07.5	227 39.6	23.3	161 50.6	22.2
05	310 46.2	296 20.6	30.0	295 48.6	08.2	242 41.5	23.4	176 52.9	22.2
06	325 48.7	311 21.5	N 5 30.3	310 49.3	N 5 09.0	257 43.3	N21 23.5	191 55.2	N18 22.2
W 07	340 51.2	326 22.4	30.6	325 50.0	09.7	272 45.2	23.6	206 57.5	22.1
E 08	355 53.6	341 23.3	30.9	340 50.7	10.5	287 47.0	23.7	221 59.8	22.1
D 09	10 56.1	356 24.2	·· 31.2	355 51.4	·· 11.2	302 48.9	·· 23.8	237 02.1	·· 22.0
N 10	25 58.5	11 25.1	31.5	10 52.1	11.9	317 50.7	23.9	252 04.4	22.0
E 11	41 01.0	26 26.0	31.8	25 52.8	12.7	332 52.6	24.0	267 06.7	21.9
S 12	56 03.5	41 26.9	N 5 32.1	40 53.6	N 5 13.4	347 54.4	N21 24.1	282 09.0	N18 21.9
D 13	71 05.9	56 27.8	32.4	55 54.3	14.2	2 56.3	24.2	297 11.3	21.8
A 14	86 08.4	71 28.7	32.7	70 55.0	14.9	17 58.1	24.2	312 13.6	21.8
Y 15	101 10.9	86 29.6	·· 33.0	85 55.7	·· 15.6	33 00.0	·· 24.3	327 15.9	·· 21.8
16	116 13.3	101 30.4	33.3	100 56.4	16.4	48 01.9	24.4	342 18.2	21.7
17	131 15.8	116 31.3	33.6	115 57.1	17.1	63 03.7	24.5	357 20.5	21.7
18	146 18.3	131 32.2	N 5 33.9	130 57.8	N 5 17.9	78 05.6	N21 24.6	12 22.8	N18 21.6
19	161 20.7	146 33.1	34.2	145 58.5	18.6	93 07.4	24.7	27 25.1	21.6
20	176 23.2	161 34.0	34.5	160 59.2	19.3	108 09.3	24.8	42 27.4	21.5
21	191 25.7	176 34.9	·· 34.8	175 59.9	·· 20.1	123 11.1	·· 24.9	57 29.7	·· 21.5
22	206 28.1	191 35.7	35.1	191 00.6	20.8	138 13.0	25.0	72 32.1	21.5
23	221 30.6	206 36.6	35.4	206 01.3	21.6	153 14.8	25.0	87 34.4	21.4
Mer. Pass.	h m 8 20.3	v 0.9	d 0.3	v 0.7	d 0.7	v 1.9	d 0.1	v 2.3	d 0.0

STARS		
Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 39.4	S40 23.8
Achernar	335 47.5	S57 21.0
Acrux	173 39.2	S62 58.7
Adhara	255 34.1	S28 56.8
Aldebaran	291 20.9	N16 27.7
Alioth	166 44.2	N56 05.1
Alkaid	153 19.9	N49 25.7
Al Na'ir	28 17.9	S47 04.0
Alnilam	276 14.3	S 1 13.1
Alphard	218 22.8	S 8 33.8
Alphecca	126 33.7	N26 47.4
Alpheratz	358 11.8	N28 57.8
Altair	62 34.6	N 8 48.5
Ankaa	353 42.8	S42 25.6
Antares	112 59.3	S26 22.9
Arcturus	146 20.2	N19 18.0
Atria	108 25.0	S68 59.1
Avior	234 29.3	S59 26.6
Bellatrix	279 01.5	N 6 19.6
Betelgeuse	271 31.0	N 7 24.0
Canopus	264 08.6	S52 41.3
Capella	281 15.1	N45 58.5
Deneb	49 49.8	N45 11.8
Denebola	183 01.2	N14 41.9
Diphda	349 23.4	S18 06.6
Dubhe	194 24.8	N61 52.6
Elnath	278 47.3	N28 35.2
Eltanin	90 58.3	N51 29.4
Enif	34 13.8	N 9 46.2
Fomalhaut	15 54.0	S29 44.4
Gacrux	172 30.8	S56 59.5
Gienah	176 20.1	S17 25.2
Hadar	149 25.9	S60 16.0
Hamal	328 31.8	N23 21.2
Kaus Aust.	84 19.5	S34 23.6
Kochab	137 17.9	N74 15.0
Markab	14 05.5	N15 04.9
Menkar	314 43.8	N 3 59.9
Menkent	148 39.3	S36 15.7
Miaplacidus	221 45.5	S69 37.9
Mirfak	309 19.8	N49 46.7
Nunki	76 31.7	S26 19.4
Peacock	54 01.8	S56 48.2
Pollux	244 01.1	N28 04.8
Procyon	245 28.3	N 5 16.8
Rasalhague	96 31.4	N12 34.6
Regulus	208 12.4	N12 04.6
Rigel	281 38.5	S 8 13.8
Rigil Kent.	140 28.2	S60 44.6
Sabik	102 43.4	S15 41.8
Schedar	350 11.9	N56 24.6
Shaula	96 58.4	S37 05.2
Sirius	258 58.0	S16 41.4
Spica	158 59.6	S11 02.7
Suhail	223 12.5	S43 20.8
Vega	80 57.0	N38 45.7
Zuben'ubi	137 35.2	S15 56.9

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	346 18.8	9 16
Mars	345 53.3	9 18
Jupiter	292 12.9	12 51
Saturn	226 11.2	17 14

	G.M.T.	SUN G.H.A.	SUN Dec.	MOON G.H.A.	MOON *v*	MOON Dec.	MOON *d*	MOON H.P.
	d h	° ′	° ′	° ′	′	° ′	′	′
	16 00	180 55.8	N19 01.2	203 33.9	14.0	N11 29.3	7.7	54.3
	01	195 55.8	01.8	218 06.9	13.9	11 37.0	7.6	54.3
	02	210 55.8	02.4	232 39.8	14.0	11 44.6	7.6	54.3
	03	225 55.8	·· 02.9	247 12.8	13.9	11 52.2	7.6	54.2
	04	240 55.8	03.5	261 45.7	13.9	11 59.8	7.4	54.2
	05	255 55.8	04.1	276 18.6	14.0	12 07.2	7.5	54.2
	06	270 55.8	N19 04.7	290 51.6	13.8	N12 14.7	7.3	54.2
	07	285 55.7	05.3	305 24.4	13.9	12 22.0	7.4	54.2
	08	300 55.7	05.8	319 57.3	13.8	12 29.4	7.2	54.2
M	09	315 55.7	·· 06.4	334 30.1	13.9	12 36.6	7.2	54.2
O	10	330 55.7	07.0	349 03.0	13.8	12 43.8	7.2	54.2
N	11	345 55.7	07.6	3 35.8	13.8	12 51.0	7.1	54.2
D	12	0 55.7	N19 08.1	18 08.6	13.7	N12 58.1	7.0	54.2
A	13	15 55.7	08.7	32 41.3	13.8	13 05.1	7.0	54.2
Y	14	30 55.7	09.3	47 14.1	13.7	13 12.1	6.9	54.1
	15	45 55.6	·· 09.9	61 46.8	13.7	13 19.0	6.9	54.1
	16	60 55.6	10.4	76 19.5	13.7	13 25.9	6.8	54.1
	17	75 55.6	11.0	90 52.2	13.6	13 32.7	6.7	54.1
	18	90 55.6	N19 11.6	105 24.8	13.7	N13 39.4	6.7	54.1
	19	105 55.6	12.1	119 57.5	13.6	13 46.1	6.6	54.1
	20	120 55.6	12.7	134 30.1	13.6	13 52.7	6.6	54.1
	21	135 55.5	·· 13.3	149 02.7	13.5	13 59.3	6.5	54.1
	22	150 55.5	13.9	163 35.2	13.6	14 05.8	6.4	54.1
	23	165 55.5	14.4	178 07.8	13.5	14 12.2	6.4	54.1
	17 00	180 55.5	N19 15.0	192 40.3	13.5	N14 18.6	6.3	54.1
	01	195 55.5	15.6	207 12.8	13.5	14 24.9	6.2	54.1
	02	210 55.5	16.1	221 45.3	13.5	14 31.1	6.2	54.1
	03	225 55.4	·· 16.7	236 17.8	13.4	14 37.3	6.1	54.1
	04	240 55.4	17.3	250 50.2	13.4	14 43.4	6.1	54.0
	05	255 55.4	17.8	265 22.6	13.4	14 49.5	5.9	54.0
	06	270 55.4	N19 18.4	279 55.0	13.4	N14 55.4	6.0	54.0
	07	285 55.4	19.0	294 27.4	13.3	15 01.4	5.8	54.0
T	08	300 55.4	19.5	308 59.7	13.4	15 07.2	5.8	54.0
U	09	315 55.3	·· 20.1	323 32.1	13.3	15 13.0	5.7	54.0
E	10	330 55.3	20.6	338 04.4	13.3	15 18.7	5.6	54.0
S	11	345 55.3	21.2	352 36.7	13.2	15 24.3	5.6	54.0
D	12	0 55.3	N19 21.8	7 08.9	13.3	N15 29.9	5.5	54.0
A	13	15 55.3	22.3	21 41.2	13.2	15 35.4	5.5	54.0
Y	14	30 55.2	22.9	36 13.4	13.2	15 40.9	5.3	54.0
	15	45 55.2	·· 23.4	50 45.6	13.1	15 46.2	5.3	54.0
	16	60 55.2	24.0	65 17.7	13.2	15 51.5	5.3	54.0
	17	75 55.2	24.6	79 49.9	13.1	15 56.8	5.1	54.0
	18	90 55.2	N19 25.1	94 22.0	13.1	N16 01.9	5.1	54.0
	19	105 55.1	25.7	108 54.1	13.1	16 07.0	5.0	54.0
	20	120 55.1	26.2	123 26.2	13.1	16 12.0	5.0	54.0
	21	135 55.1	·· 26.8	137 58.3	13.0	16 17.0	4.8	54.0
	22	150 55.1	27.3	152 30.3	13.0	16 21.8	4.8	54.0
	23	165 55.1	27.9	167 02.3	13.0	16 26.6	4.7	54.0
	18 00	180 55.0	N19 28.5	181 34.3	13.0	N16 31.3	4.7	54.0
	01	195 55.0	29.0	196 06.3	12.9	16 36.0	4.6	54.0
	02	210 55.0	29.6	210 38.2	13.0	16 40.6	4.5	54.0
	03	225 55.0	·· 30.1	225 10.2	12.9	16 45.1	4.4	54.0
	04	240 54.9	30.7	239 42.1	12.9	16 49.5	4.3	54.0
	05	255 54.9	31.2	254 14.0	12.8	16 53.8	4.3	53.9
	06	270 54.9	N19 31.8	268 45.8	12.9	N16 58.1	4.2	53.9
W	07	285 54.9	32.3	283 17.7	12.8	17 02.3	4.1	53.9
E	08	300 54.8	32.9	297 49.5	12.8	17 06.4	4.1	53.9
D	09	315 54.8	·· 33.4	312 21.3	12.8	17 10.5	3.9	53.9
N	10	330 54.8	34.0	326 53.1	12.8	17 14.4	3.9	53.9
E	11	345 54.8	34.5	341 24.9	12.7	17 18.3	3.8	53.9
S	12	0 54.7	N19 35.1	355 56.6	12.7	N17 22.1	3.8	53.9
D	13	15 54.7	35.6	10 28.3	12.8	17 25.9	3.6	53.9
A	14	30 54.7	36.2	25 00.1	12.6	17 29.5	3.6	53.9
Y	15	45 54.7	·· 36.7	39 31.7	12.7	17 33.1	3.5	53.9
	16	60 54.6	37.2	54 03.4	12.7	17 36.6	3.4	53.9
	17	75 54.6	37.8	68 35.1	12.6	17 40.0	3.3	53.9
	18	90 54.6	N19 38.3	83 06.7	12.6	N17 43.3	3.3	53.9
	19	105 54.6	38.9	97 38.3	12.6	17 46.6	3.2	53.9
	20	120 54.5	39.4	112 09.9	12.6	17 49.8	3.1	53.9
	21	135 54.5	·· 40.0	126 41.5	12.5	17 52.9	3.0	53.9
	22	150 54.5	40.5	141 13.0	12.6	17 55.9	2.9	53.9
	23	165 54.5	41.1	155 44.6	12.5	17 58.8	2.9	53.9
		S.D. 15.8	*d* 0.6	S.D. 14.8		14.7		14.7

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 16	Moonrise 17	Moonrise 18	Moonrise 19
°	h m	h m	h m	h m	h m	h m	h m
N 72	□	□	□	01 52	01 44	01 32	00 52
N 70	□	□	□	02 11	02 13	02 18	02 29
68	////	////	01 36	02 27	02 35	02 48	03 09
66	////	////	02 15	02 39	02 52	03 11	03 37
64	////	00 54	02 41	02 50	03 07	03 28	03 58
62	////	01 43	03 02	02 59	03 18	03 43	04 15
60	////	02 13	03 18	03 07	03 29	03 56	04 29
N 58	00 48	02 35	03 32	03 13	03 38	04 06	04 41
56	01 33	02 53	03 44	03 20	03 45	04 16	04 52
54	02 01	03 08	03 54	03 25	03 52	04 24	05 01
52	02 22	03 21	04 03	03 30	03 59	04 32	05 10
50	02 39	03 32	04 12	03 34	04 04	04 38	05 17
45	03 11	03 55	04 29	03 44	04 17	04 53	05 33
N 40	03 34	04 12	04 43	03 52	04 27	05 05	05 46
35	03 53	04 27	04 55	03 59	04 36	05 15	05 57
30	04 08	04 39	05 05	04 05	04 43	05 24	06 07
20	04 31	05 00	05 23	04 16	04 57	05 39	06 24
N 10	04 50	05 16	05 39	04 25	05 08	05 53	06 39
0	05 05	05 31	05 53	04 34	05 19	06 05	06 52
S 10	05 19	05 45	06 07	04 43	05 31	06 18	07 06
20	05 32	05 59	06 22	04 53	05 42	06 32	07 21
30	05 44	06 13	06 39	05 04	05 56	06 48	07 38
35	05 51	06 22	06 49	05 10	06 04	06 57	07 48
40	05 58	06 31	07 00	05 17	06 13	07 07	07 59
45	06 05	06 41	07 13	05 26	06 24	07 19	08 13
S 50	06 13	06 53	07 29	05 36	06 36	07 34	08 29
52	06 17	06 59	07 37	05 41	06 42	07 41	08 37
54	06 21	07 05	07 45	05 46	06 49	07 49	08 45
56	06 25	07 11	07 54	05 52	06 57	07 58	08 55
58	06 30	07 19	08 05	05 59	07 05	08 08	09 06
S 60	06 35	07 27	08 17	06 06	07 14	08 19	09 18

Lat.	Sunset	Twilight Civil	Twilight Naut.	Moonset 16	Moonset 17	Moonset 18	Moonset 19
°	h m	h m	h m	h m	h m	h m	h m
N 72	□	□	□	20 19	22 06	24 24	00 24
N 70	□	□	□	19 51	21 21	22 46	23 57
68	22 22	////	////	19 30	20 51	22 07	23 10
66	21 41	////	////	19 13	20 29	21 39	22 39
64	21 14	23 08	////	19 00	20 12	21 19	22 16
62	20 53	22 13	////	18 49	19 58	21 02	21 58
60	20 36	21 42	////	18 39	19 46	20 48	21 43
N 58	20 22	21 19	23 13	18 30	19 35	20 36	21 30
56	20 10	21 01	22 23	18 23	19 26	20 25	21 19
54	19 59	20 46	21 54	18 17	19 18	20 16	21 10
52	19 50	20 33	21 33	18 11	19 11	20 08	21 01
50	19 42	20 22	21 16	18 05	19 05	20 01	20 53
45	19 24	19 59	20 43	17 54	18 51	19 45	20 37
N 40	19 10	19 41	20 19	17 44	18 39	19 33	20 23
35	18 58	19 26	20 01	17 36	18 30	19 22	20 12
30	18 47	19 14	19 45	17 29	18 21	19 12	20 02
20	18 30	18 53	19 21	17 17	18 06	18 56	19 44
N 10	18 14	18 37	19 03	17 06	17 54	18 41	19 29
0	18 00	18 22	18 47	16 56	17 42	18 28	19 15
S 10	17 46	18 08	18 34	16 46	17 30	18 15	19 01
20	17 31	17 54	18 21	16 35	17 17	18 00	18 46
30	17 14	17 39	18 08	16 23	17 02	17 44	18 29
35	17 04	17 31	18 01	16 16	16 54	17 35	18 19
40	16 52	17 22	17 54	16 08	16 44	17 24	18 07
45	16 39	17 11	17 47	15 59	16 33	17 11	17 54
S 50	16 23	16 59	17 39	15 48	16 20	16 56	17 37
52	16 16	16 53	17 35	15 43	16 13	16 48	17 29
54	16 07	16 47	17 31	15 37	16 06	16 40	17 21
56	15 58	16 41	17 27	15 31	15 58	16 32	17 11
58	15 47	16 33	17 22	15 23	15 50	16 21	17 00
S 60	15 35	16 25	17 17	15 15	15 40	16 10	16 47

Day	SUN Eqn. of Time 00ʰ	SUN Eqn. of Time 12ʰ	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
	m s	m s	h m	h m	h m	d	
16	03 43	03 43	11 56	10 45	23 08	28	
17	03 42	03 41	11 56	11 30	23 54	29	●
18	03 40	03 39	11 56	12 17	24 40	00	

	G.M.T.	ARIES	VENUS −4.2		MARS +1.3		JUPITER −1.5		SATURN +0.6	
		G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
	d h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
	19 00	236 33.0	221 37.5	N 5 35.7	221 02.0	N 5 22.3	168 16.7	N21 25.1	102 36.7	N18 21.4
	01	251 35.5	236 38.4	36.1	236 02.7	23.0	183 18.5	25.2	117 39.0	21.3
	02	266 38.0	251 39.2	36.4	251 03.4	23.8	198 20.4	25.3	132 41.3	21.3
	03	281 40.4	266 40.1	·· 36.7	266 04.1	·· 24.5	213 22.2	·· 25.4	147 43.6	·· 21.2
	04	296 42.9	281 41.0	37.0	281 04.9	25.2	228 24.1	25.5	162 45.9	21.2
	05	311 45.4	296 41.8	37.3	296 05.6	26.0	243 25.9	25.6	177 48.2	21.1
	06	326 47.8	311 42.7	N 5 37.6	311 06.3	N 5 26.7	258 27.8	N21 25.7	192 50.5	N18 21.1
	07	341 50.3	326 43.6	38.0	326 07.0	27.5	273 29.6	25.8	207 52.8	21.0
T	08	356 52.8	341 44.4	38.3	341 07.7	28.2	288 31.5	25.9	222 55.1	21.0
H	09	11 55.2	356 45.3	·· 38.6	356 08.4	·· 28.9	303 33.3	·· 25.9	237 57.4	·· 21.0
U	10	26 57.7	11 46.1	38.9	11 09.1	29.7	318 35.2	26.0	252 59.7	20.9
R	11	42 00.2	26 47.0	39.3	26 09.8	30.4	333 37.0	26.1	268 02.0	20.9
S	12	57 02.6	41 47.8	N 5 39.6	41 10.5	N 5 31.1	348 38.9	N21 26.2	283 04.3	N18 20.8
D	13	72 05.1	56 48.7	39.9	56 11.2	31.9	3 40.7	26.3	298 06.6	20.8
A	14	87 07.5	71 49.5	40.2	71 11.9	32.6	18 42.6	26.4	313 08.9	20.7
Y	15	102 10.0	86 50.4	·· 40.6	86 12.6	·· 33.4	33 44.5	·· 26.5	328 11.2	·· 20.7
	16	117 12.5	101 51.2	40.9	101 13.3	34.1	48 46.3	26.6	343 13.5	20.6
	17	132 14.9	116 52.1	41.2	116 14.0	34.8	63 48.2	26.7	358 15.8	20.6
	18	147 17.4	131 52.9	N 5 41.6	131 14.7	N 5 35.6	78 50.0	N21 26.7	13 18.1	N18 20.6
	19	162 19.9	146 53.8	41.9	146 15.5	36.3	93 51.9	26.8	28 20.4	20.5
	20	177 22.3	161 54.6	42.2	161 16.2	37.0	108 53.7	26.9	43 22.7	20.5
	21	192 24.8	176 55.5	·· 42.6	176 16.9	·· 37.8	123 55.6	·· 27.0	58 25.0	·· 20.4
	22	207 27.3	191 56.3	42.9	191 17.6	38.5	138 57.4	27.1	73 27.3	20.4
	23	222 29.7	206 57.1	43.2	206 18.3	39.2	153 59.3	27.2	88 29.6	20.3
	20 00	237 32.2	221 58.0	N 5 43.6	221 19.0	N 5 40.0	169 01.1	N21 27.3	103 31.9	N18 20.3
	01	252 34.6	236 58.8	43.9	236 19.7	40.7	184 03.0	27.4	118 34.2	20.2
	02	267 37.1	251 59.6	44.3	251 20.4	41.4	199 04.8	27.4	133 36.5	20.2
	03	282 39.6	267 00.5	·· 44.6	266 21.1	·· 42.2	214 06.7	·· 27.5	148 38.8	·· 20.1
	04	297 42.0	282 01.3	44.9	281 21.8	42.9	229 08.5	27.6	163 41.1	20.1
	05	312 44.5	297 02.1	45.3	296 22.5	43.7	244 10.4	27.7	178 43.4	20.0
	06	327 47.0	312 02.9	N 5 45.6	311 23.2	N 5 44.4	259 12.2	N21 27.8	193 45.7	N18 20.0
	07	342 49.4	327 03.8	46.0	326 23.9	45.1	274 14.1	27.9	208 48.0	20.0
	08	357 51.9	342 04.6	46.3	341 24.6	45.9	289 15.9	28.0	223 50.3	19.9
F	09	12 54.4	357 05.4	·· 46.7	356 25.3	·· 46.6	304 17.8	·· 28.1	238 52.6	·· 19.9
R	10	27 56.8	12 06.2	47.0	11 26.1	47.3	319 19.6	28.2	253 54.9	19.8
I	11	42 59.3	27 07.0	47.4	26 26.8	48.1	334 21.5	28.2	268 57.2	19.8
D	12	58 01.8	42 07.8	N 5 47.7	41 27.5	N 5 48.8	349 23.3	N21 28.3	283 59.5	N18 19.7
A	13	73 04.2	57 08.7	48.1	56 28.2	49.5	4 25.2	28.4	299 01.7	19.7
Y	14	88 06.7	72 09.5	48.4	71 28.9	50.3	19 27.0	28.5	314 04.0	19.6
	15	103 09.1	87 10.3	·· 48.8	86 29.6	·· 51.0	34 28.9	·· 28.6	329 06.3	·· 19.6
	16	118 11.6	102 11.1	49.2	101 30.3	51.7	49 30.7	28.7	344 08.6	19.5
	17	133 14.1	117 11.9	49.5	116 31.0	52.5	64 32.6	28.8	359 10.9	19.5
	18	148 16.5	132 12.7	N 5 49.9	131 31.7	N 5 53.2	79 34.4	N21 28.9	14 13.2	N18 19.4
	19	163 19.0	147 13.5	50.2	146 32.4	53.9	94 36.3	28.9	29 15.5	19.4
	20	178 21.5	162 14.3	50.6	161 33.1	54.7	109 38.1	29.0	44 17.8	19.4
	21	193 23.9	177 15.1	·· 51.0	176 33.8	·· 55.4	124 40.0	·· 29.1	59 20.1	·· 19.3
	22	208 26.4	192 15.9	51.3	191 34.5	56.1	139 41.8	29.2	74 22.4	19.3
	23	223 28.9	207 16.7	51.7	206 35.2	56.9	154 43.7	29.3	89 24.7	19.2
	21 00	238 31.3	222 17.5	N 5 52.0	221 35.9	N 5 57.6	169 45.5	N21 29.4	104 27.0	N18 19.2
	01	253 33.8	237 18.3	52.4	236 36.6	58.3	184 47.4	29.5	119 29.3	19.1
	02	268 36.3	252 19.1	52.8	251 37.4	59.1	199 49.2	29.6	134 31.6	19.1
	03	283 38.7	267 19.9	·· 53.1	266 38.1	5 59.8	214 51.1	·· 29.6	149 33.9	·· 19.0
	04	298 41.2	282 20.7	53.5	281 38.8	6 00.5	229 52.9	29.7	164 36.2	19.0
	05	313 43.6	297 21.5	53.9	296 39.5	01.3	244 54.8	29.8	179 38.5	18.9
	06	328 46.1	312 22.2	N 5 54.2	311 40.2	N 6 02.0	259 56.6	N21 29.9	194 40.8	N18 18.9
	07	343 48.6	327 23.0	54.6	326 40.9	02.7	274 58.5	30.0	209 43.1	18.8
S	08	358 51.0	342 23.8	55.0	341 41.6	03.4	290 00.3	30.1	224 45.4	18.8
A	09	13 53.5	357 24.6	·· 55.4	356 42.3	·· 04.2	305 02.2	·· 30.2	239 47.7	·· 18.7
T	10	28 56.0	12 25.4	55.7	11 43.0	04.9	320 04.0	30.3	254 50.0	18.7
U	11	43 58.4	27 26.1	56.1	26 43.7	05.6	335 05.9	30.3	269 52.2	18.7
R	12	59 00.9	42 26.9	N 5 56.5	41 44.4	N 6 06.4	350 07.7	N21 30.4	284 54.5	N18 18.6
D	13	74 03.4	57 27.7	56.9	56 45.1	07.1	5 09.6	30.5	299 56.8	18.6
A	14	89 05.8	72 28.5	57.3	71 45.8	07.8	20 11.4	30.6	314 59.1	18.5
Y	15	104 08.3	87 29.2	·· 57.6	86 46.5	·· 08.6	35 13.3	·· 30.7	330 01.4	·· 18.5
	16	119 10.7	102 30.0	58.0	101 47.2	09.3	50 15.1	30.8	345 03.7	18.4
	17	134 13.2	117 30.8	58.4	116 47.9	10.0	65 17.0	30.9	0 06.0	18.4
	18	149 15.7	132 31.6	N 5 58.8	131 48.7	N 6 10.8	80 18.8	N21 31.0	15 08.3	N18 18.3
	19	164 18.1	147 32.3	59.2	146 49.4	11.5	95 20.7	31.0	30 10.6	18.3
	20	179 20.6	162 33.1	59.5	161 50.1	12.2	110 22.5	31.1	45 12.9	18.2
	21	194 23.1	177 33.9	5 59.9	176 50.8	·· 12.9	125 24.4	·· 31.2	60 15.2	·· 18.2
	22	209 25.5	192 34.6	6 00.3	191 51.5	13.7	140 26.2	31.3	75 17.5	18.1
	23	224 28.0	207 35.4	00.7	206 52.2	14.4	155 28.1	31.4	90 19.8	18.1
	Mer. Pass.	h m 8 08.5	v 0.8	d 0.4	v 0.7	d 0.7	v 1.9	d 0.1	v 2.3	d 0.0

STARS		
Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 39.4	S40 23.8
Achernar	335 47.5	S57 21.0
Acrux	173 39.2	S62 58.7
Adhara	255 34.2	S28 56.8
Aldebaran	291 20.9	N16 27.7
Alioth	166 44.2	N56 05.1
Alkaid	153 19.9	N49 25.7
Al Na'ir	28 17.8	S47 04.0
Alnilam	276 14.3	S 1 13.1
Alphard	218 22.8	S 8 33.8
Alphecca	126 33.7	N26 47.5
Alpheratz	358 11.8	N28 57.8
Altair	62 34.5	N 8 48.5
Ankaa	353 42.8	S42 25.6
Antares	112 59.2	S26 22.9
Arcturus	146 20.2	N19 18.0
Atria	108 24.9	S68 59.1
Avior	234 29.3	S59 26.6
Bellatrix	279 01.5	N 6 19.6
Betelgeuse	271 31.0	N 7 24.0
Canopus	264 08.6	S52 41.3
Capella	281 15.1	N45 58.5
Deneb	49 49.8	N45 11.8
Denebola	183 01.2	N14 41.9
Diphda	349 23.4	S18 06.6
Dubhe	194 24.8	N61 52.6
Elnath	278 47.3	N28 35.2
Eltanin	90 58.3	N51 29.4
Enif	34 13.8	N 9 46.2
Fomalhaut	15 54.0	S29 44.4
Gacrux	172 30.8	S56 59.5
Gienah	176 20.1	S17 25.2
Hadar	149 25.9	S60 16.0
Hamal	328 31.8	N23 21.2
Kaus Aust.	84 19.5	S34 23.6
Kochab	137 17.9	N74 15.0
Markab	14 05.5	N15 04.9
Menkar	314 43.8	N 4 00.0
Menkent	148 39.3	S36 15.7
Miaplacidus	221 45.5	S69 37.9
Mirfak	309 19.8	N49 46.7
Nunki	76 31.7	S26 19.4
Peacock	54 01.7	S56 48.2
Pollux	244 01.2	N28 04.8
Procyon	245 28.3	N 5 16.8
Rasalhague	96 31.4	N12 34.6
Regulus	208 12.4	N12 04.6
Rigel	281 38.5	S 8 13.8
Rigil Kent.	140 28.1	S60 44.6
Sabik	102 43.4	S15 41.8
Schedar	350 11.9	N56 24.6
Shaula	96 58.4	S37 05.2
Sirius	258 58.0	S16 41.4
Spica	158 59.6	S11 02.7
Suhail	223 12.5	S43 20.8
Vega	80 57.0	N38 45.7
Zuben'ubi	137 35.2	S15 56.9

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	344 25.8	9 12
Mars	343 46.8	9 14
Jupiter	291 28.9	12 42
Saturn	225 59.7	17 03

1977 MAY 19, 20, 21 (THURS., FRI., SAT.)

	G.M.T.	SUN		MOON				
		G.H.A.	Dec.	G.H.A.	*v*	Dec.	*d*	H.P.
	d h	° ′	° ′	° ′	′	° ′	′	′
	19 00	180 54.4	N19 41.6	170 16.1	12.5	N18 01.7	2.7	53.9
	01	195 54.4	42.1	184 47.6	12.5	18 04.4	2.7	53.9
	02	210 54.4	42.7	199 19.1	12.5	18 07.1	2.6	53.9
	03	225 54.3	·· 43.2	213 50.6	12.4	18 09.7	2.6	53.9
	04	240 54.3	43.7	228 22.0	12.5	18 12.3	2.4	53.9
	05	255 54.3	44.3	242 53.5	12.4	18 14.7	2.4	53.9
	06	270 54.3	N19 44.8	257 24.9	12.4	N18 17.1	2.2	53.9
	07	285 54.2	45.4	271 56.3	12.4	18 19.3	2.2	54.0
T	08	300 54.2	45.9	286 27.7	12.4	18 21.5	2.1	54.0
H	09	315 54.2	·· 46.4	300 59.1	12.4	18 23.6	2.1	54.0
U	10	330 54.1	47.0	315 30.5	12.3	18 25.7	1.9	54.0
R	11	345 54.1	47.5	330 01.8	12.4	18 27.6	1.9	54.0
S	12	0 54.1	N19 48.0	344 33.2	12.3	N18 29.5	1.7	54.0
D	13	15 54.0	48.6	359 04.5	12.3	18 31.2	1.7	54.0
A	14	30 54.0	49.1	13 35.8	12.4	18 32.9	1.6	54.0
Y	15	45 54.0	·· 49.6	28 07.2	12.2	18 34.5	1.5	54.0
	16	60 53.9	50.2	42 38.4	12.3	18 36.0	1.5	54.0
	17	75 53.9	50.7	57 09.7	12.3	18 37.5	1.3	54.0
	18	90 53.9	N19 51.2	71 41.0	12.3	N18 38.8	1.3	54.0
	19	105 53.8	51.8	86 12.3	12.2	18 40.1	1.1	54.0
	20	120 53.8	52.3	100 43.5	12.3	18 41.2	1.1	54.0
	21	135 53.8	·· 52.8	115 14.8	12.2	18 42.3	1.0	54.0
	22	150 53.7	53.3	129 46.0	12.2	18 43.3	1.0	54.0
	23	165 53.7	53.9	144 17.2	12.2	18 44.3	0.8	54.0
	20 00	180 53.7	N19 54.4	158 48.4	12.2	N18 45.1	0.7	54.0
	01	195 53.6	54.9	173 19.6	12.2	18 45.8	0.7	54.0
	02	210 53.6	55.4	187 50.8	12.2	18 46.5	0.6	54.0
	03	225 53.6	·· 56.0	202 22.0	12.2	18 47.1	0.5	54.0
	04	240 53.5	56.5	216 53.2	12.2	18 47.6	0.4	54.0
	05	255 53.5	57.0	231 24.4	12.1	18 48.0	0.3	54.0
	06	270 53.5	N19 57.5	245 55.5	12.2	N18 48.3	0.2	54.0
	07	285 53.4	58.1	260 26.7	12.1	18 48.5	0.1	54.0
	08	300 53.4	58.6	274 57.8	12.2	18 48.6	0.1	54.1
F	09	315 53.4	·· 59.1	289 29.0	12.1	18 48.7	0.0	54.1
R	10	330 53.3	19 59.6	304 00.1	12.2	18 48.7	0.2	54.1
I	11	345 53.3	20 00.1	318 31.3	12.1	18 48.5	0.2	54.1
D	12	0 53.3	N20 00.7	333 02.4	12.1	N18 48.3	0.3	54.1
A	13	15 53.2	01.2	347 33.5	12.1	18 48.0	0.3	54.1
Y	14	30 53.2	01.7	2 04.6	12.1	18 47.7	0.5	54.1
	15	45 53.1	·· 02.2	16 35.7	12.2	18 47.2	0.6	54.1
	16	60 53.1	02.7	31 06.9	12.1	18 46.6	0.6	54.1
	17	75 53.1	03.3	45 38.0	12.1	18 46.0	0.7	54.1
	18	90 53.0	N20 03.8	60 09.1	12.1	N18 45.3	0.8	54.1
	19	105 53.0	04.3	74 40.2	12.1	18 44.5	0.9	54.1
	20	120 53.0	04.8	89 11.3	12.1	18 43.6	1.0	54.1
	21	135 52.9	·· 05.3	103 42.4	12.1	18 42.6	1.1	54.2
	22	150 52.9	05.8	118 13.5	12.1	18 41.5	1.2	54.2
	23	165 52.8	06.3	132 44.6	12.1	18 40.3	1.2	54.2
	21 00	180 52.8	N20 06.9	147 15.7	12.1	N18 39.1	1.4	54.2
	01	195 52.8	07.4	161 46.8	12.1	18 37.7	1.4	54.2
	02	210 52.7	07.9	176 17.9	12.1	18 36.3	1.5	54.2
	03	225 52.7	·· 08.4	190 49.0	12.1	18 34.8	1.6	54.2
	04	240 52.6	08.9	205 20.1	12.1	18 33.2	1.7	54.2
	05	255 52.6	09.4	219 51.2	12.1	18 31.5	1.7	54.2
	06	270 52.6	N20 09.9	234 22.3	12.1	N18 29.8	1.9	54.2
	07	285 52.5	10.4	248 53.4	12.1	18 27.9	1.9	54.2
S	08	300 52.5	10.9	263 24.5	12.1	18 26.0	2.1	54.3
A	09	315 52.4	·· 11.4	277 55.6	12.1	18 23.9	2.1	54.3
T	10	330 52.4	11.9	292 26.7	12.1	18 21.8	2.2	54.3
U	11	345 52.4	12.5	306 57.8	12.2	18 19.6	2.3	54.3
R	12	0 52.3	N20 13.0	321 29.0	12.1	N18 17.3	2.4	54.3
D	13	15 52.3	13.5	336 00.1	12.1	18 14.9	2.4	54.3
A	14	30 52.2	14.0	350 31.2	12.1	18 12.5	2.6	54.3
Y	15	45 52.2	·· 14.5	5 02.3	12.1	18 09.9	2.6	54.3
	16	60 52.1	15.0	19 33.4	12.2	18 07.3	2.7	54.4
	17	75 52.1	15.5	34 04.6	12.1	18 04.6	2.8	54.4
	18	90 52.1	N20 16.0	48 35.7	12.2	N18 01.8	2.9	54.4
	19	105 52.0	16.5	63 06.9	12.1	17 58.9	3.0	54.4
	20	120 52.0	17.0	77 38.0	12.2	17 55.9	3.0	54.4
	21	135 51.9	·· 17.5	92 09.2	12.1	17 52.9	3.1	54.4
	22	150 51.9	18.0	106 40.3	12.2	17 49.8	3.3	54.4
	23	165 51.8	18.5	121 11.5	12.2	17 46.5	3.3	54.4
		S.D. 15.8	*d* 0.5	S.D. 14.7		14.7		14.8

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 19	Moonrise 20	Moonrise 21	Moonrise 22
°	h m	h m	h m	h m	h m	h m	h m
N 72	▭	▭	▭	00 52	▭	▭	04 07
N 70	▭	▭	▭	02 29	02 57	03 52	05 11
68	////	////	01 17	03 09	03 44	04 37	05 47
66	////	////	02 03	03 37	04 15	05 07	06 12
64	////	00 16	02 32	03 58	04 38	05 29	06 32
62	////	01 30	02 54	04 15	04 56	05 47	06 48
60	////	02 03	03 11	04 29	05 11	06 02	07 01
N 58	00 15	02 28	03 26	04 41	05 24	06 14	07 12
56	01 21	02 47	03 39	04 52	05 35	06 25	07 22
54	01 52	03 02	03 50	05 01	05 45	06 35	07 31
52	02 15	03 16	03 59	05 10	05 53	06 43	07 39
50	02 33	03 27	04 08	05 17	06 01	06 51	07 46
45	03 06	03 51	04 26	05 33	06 18	07 07	08 01
N 40	03 31	04 10	04 41	05 46	06 31	07 21	08 13
35	03 50	04 25	04 53	05 57	06 43	07 32	08 24
30	04 06	04 37	05 04	06 07	06 53	07 42	08 33
20	04 30	04 58	05 22	06 24	07 10	07 59	08 49
N 10	04 49	05 16	05 38	06 39	07 26	08 14	09 02
0	05 05	05 31	05 53	06 52	07 40	08 28	09 15
S 10	05 19	05 45	06 08	07 06	07 54	08 42	09 28
20	05 33	06 00	06 23	07 21	08 09	08 56	09 42
30	05 46	06 15	06 41	07 38	08 27	09 13	09 58
35	05 53	06 24	06 51	07 48	08 37	09 23	10 07
40	06 00	06 33	07 03	07 59	08 49	09 35	10 17
45	06 08	06 44	07 16	08 13	09 02	09 48	10 29
S 50	06 17	06 57	07 33	08 29	09 19	10 04	10 44
52	06 21	07 03	07 41	08 37	09 27	10 12	10 51
54	06 25	07 09	07 50	08 45	09 36	10 20	10 59
56	06 29	07 16	07 59	08 55	09 46	10 30	11 07
58	06 34	07 24	08 11	09 06	09 57	10 41	11 17
S 60	06 39	07 33	08 24	09 18	10 10	10 53	11 28

Lat.	Sunset	Twilight Civil	Twilight Naut.	Moonset 19	Moonset 20	Moonset 21	Moonset 22
°	h m	h m	h m	h m	h m	h m	h m
N 72	▭	▭	▭	00 24	▭	▭	02 06
N 70	▭	▭	▭	23 57	24 41	00 41	01 01
68	22 42	////	////	23 10	23 56	24 25	00 25
66	21 54	////	////	22 39	23 26	23 59	24 22
64	21 23	////	////	22 16	23 03	23 39	24 06
62	21 01	22 27	////	21 58	22 45	23 23	23 52
60	20 43	21 52	////	21 43	22 31	23 09	23 41
N 58	20 28	21 27	////	21 30	22 18	22 58	23 31
56	20 15	21 08	22 36	21 19	22 07	22 48	23 22
54	20 04	20 52	22 03	21 10	21 57	22 39	23 14
52	19 55	20 38	21 40	21 01	21 49	22 31	23 07
50	19 46	20 27	21 22	20 53	21 41	22 23	23 01
45	19 28	20 03	20 47	20 37	21 25	22 08	22 47
N 40	19 13	19 44	20 23	20 23	21 11	21 55	22 36
35	19 00	19 29	20 03	20 12	21 00	21 44	22 26
30	18 49	19 16	19 48	20 02	20 49	21 35	22 18
20	18 31	18 55	19 23	19 44	20 32	21 19	22 03
N 10	18 15	18 37	19 04	19 29	20 17	21 04	21 50
0	18 00	18 22	18 48	19 15	20 03	20 51	21 38
S 10	17 45	18 08	18 33	19 01	19 49	20 37	21 26
20	17 30	17 53	18 20	18 46	19 34	20 23	21 13
30	17 12	17 38	18 07	18 29	19 16	20 06	20 58
35	17 02	17 29	18 00	18 19	19 06	19 56	20 49
40	16 50	17 19	17 52	18 07	18 54	19 45	20 39
45	16 36	17 09	17 45	17 54	18 41	19 32	20 28
S 50	16 19	16 56	17 36	17 37	18 24	19 16	20 14
52	16 12	16 50	17 32	17 29	18 16	19 09	20 07
54	16 03	16 43	17 28	17 21	18 07	19 01	20 00
56	15 53	16 36	17 23	17 11	17 58	18 51	19 51
58	15 42	16 29	17 18	17 00	17 46	18 41	19 42
S 60	15 29	16 20	17 13	16 47	17 33	18 29	19 31

Day	SUN			MOON			
	Eqn. of Time 00ʰ	Eqn. of Time 12ʰ	Mer. Pass.	Mer. Pass. Upper	Mer. Pass. Lower	Age	Phase
	m s	m s	h m	h m	h m	d	
19	03 38	03 36	11 56	13 04	00 40	01	●
20	03 35	03 33	11 56	13 51	01 28	02	
21	03 31	03 29	11 57	14 39	02 15	03	

1977 MAY 22, 23, 24 (SUN., MON., TUES.)

G.M.T.		ARIES	VENUS −4.2		MARS +1.3		JUPITER −1.5		SATURN +0.6	
		G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
d	h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
22	00	239 30.5	222 36.1	N 6 01.1	221 52.9	N 6 15.1	170 29.9	N21 31.5	105 22.0	N18 18.0
	01	254 32.9	237 36.9	01.5	236 53.6	15.9	185 31.8	31.6	120 24.3	18.0
	02	269 35.4	252 37.6	01.9	251 54.3	16.6	200 33.6	31.6	135 26.6	17.9
	03	284 37.9	267 38.4	· · 02.3	266 55.0	· · 17.3	215 35.5	· · 31.7	150 28.9	· · 17.9
	04	299 40.3	282 39.2	02.7	281 55.7	18.0	230 37.3	31.8	165 31.2	17.8
	05	314 42.8	297 39.9	03.1	296 56.4	18.8	245 39.2	31.9	180 33.5	17.8
	06	329 45.2	312 40.7	N 6 03.4	311 57.1	N 6 19.5	260 41.0	N21 32.0	195 35.8	N18 17.8
	07	344 47.7	327 41.4	03.8	326 57.8	20.2	275 42.9	32.1	210 38.1	17.7
	08	359 50.2	342 42.2	04.2	341 58.5	21.0	290 44.7	32.2	225 40.4	17.7
S	09	14 52.6	357 42.9	· · 04.6	356 59.2	· · 21.7	305 46.6	· · 32.2	240 42.7	· · 17.6
U	10	29 55.1	12 43.6	05.0	11 59.9	22.4	320 48.4	32.3	255 45.0	17.6
N	11	44 57.6	27 44.4	05.4	27 00.7	23.1	335 50.3	32.4	270 47.2	17.5
D	12	60 00.0	42 45.1	N 6 05.8	42 01.4	N 6 23.9	350 52.1	N21 32.5	285 49.5	N18 17.5
A	13	75 02.5	57 45.9	06.2	57 02.1	24.6	5 54.0	32.6	300 51.8	17.4
Y	14	90 05.0	72 46.6	06.6	72 02.8	25.3	20 55.8	32.7	315 54.1	17.4
	15	105 07.4	87 47.3	· · 07.0	87 03.5	· · 26.1	35 57.7	· · 32.8	330 56.4	· · 17.3
	16	120 09.9	102 48.1	07.4	102 04.2	26.8	50 59.5	32.9	345 58.7	17.3
	17	135 12.4	117 48.8	07.9	117 04.9	27.5	66 01.4	32.9	1 01.0	17.2
	18	150 14.8	132 49.5	N 6 08.3	132 05.6	N 6 28.2	81 03.2	N21 33.0	16 03.3	N18 17.2
	19	165 17.3	147 50.3	08.7	147 06.3	29.0	96 05.1	33.1	31 05.6	17.1
	20	180 19.7	162 51.0	09.1	162 07.0	29.7	111 06.9	33.2	46 07.9	17.1
	21	195 22.2	177 51.7	· · 09.5	177 07.7	· · 30.4	126 08.8	· · 33.3	61 10.1	· · 17.0
	22	210 24.7	192 52.5	09.9	192 08.4	31.1	141 10.6	33.4	76 12.4	17.0
	23	225 27.1	207 53.2	10.3	207 09.1	31.9	156 12.4	33.5	91 14.7	16.9
23	00	240 29.6	222 53.9	N 6 10.7	222 09.8	N 6 32.6	171 14.3	N21 33.5	106 17.0	N18 16.9
	01	255 32.1	237 54.6	11.1	237 10.5	33.3	186 16.1	33.6	121 19.3	16.8
	02	270 34.5	252 55.3	11.5	252 11.2	34.1	201 18.0	33.7	136 21.6	16.8
	03	285 37.0	267 56.1	· · 12.0	267 11.9	· · 34.8	216 19.8	· · 33.8	151 23.9	· · 16.7
	04	300 39.5	282 56.8	12.4	282 12.7	35.5	231 21.7	33.9	166 26.2	16.7
	05	315 41.9	297 57.5	12.8	297 13.4	36.2	246 23.5	34.0	181 28.4	16.6
	06	330 44.4	312 58.2	N 6 13.2	312 14.1	N 6 37.0	261 25.4	N21 34.1	196 30.7	N18 16.6
	07	345 46.8	327 58.9	13.6	327 14.8	37.7	276 27.2	34.1	211 33.0	16.5
	08	0 49.3	342 59.6	14.0	342 15.5	38.4	291 29.1	34.2	226 35.3	16.5
M	09	15 51.8	358 00.3	· · 14.5	357 16.2	· · 39.1	306 30.9	· · 34.3	241 37.6	· · 16.4
O	10	30 54.2	13 01.1	14.9	12 16.9	39.9	321 32.8	34.4	256 39.9	16.4
N	11	45 56.7	28 01.8	15.3	27 17.6	40.6	336 34.6	34.5	271 42.2	16.3
D	12	60 59.2	43 02.5	N 6 15.7	42 18.3	N 6 41.3	351 36.5	N21 34.6	286 44.5	N18 16.3
A	13	76 01.6	58 03.2	16.2	57 19.0	42.0	6 38.3	34.7	301 46.7	16.2
Y	14	91 04.1	73 03.9	16.6	72 19.7	42.7	21 40.2	34.7	316 49.0	16.2
	15	106 06.6	88 04.6	· · 17.0	87 20.4	· · 43.5	36 42.0	· · 34.8	331 51.3	· · 16.1
	16	121 09.0	103 05.3	17.4	102 21.1	44.2	51 43.9	34.9	346 53.6	16.1
	17	136 11.5	118 06.0	17.9	117 21.8	44.9	66 45.7	35.0	1 55.9	16.0
	18	151 14.0	133 06.7	N 6 18.3	132 22.5	N 6 45.6	81 47.6	N21 35.1	16 58.2	N18 16.0
	19	166 16.4	148 07.4	18.7	147 23.2	46.4	96 49.4	35.2	32 00.5	15.9
	20	181 18.9	163 08.1	19.1	162 23.9	47.1	111 51.3	35.2	47 02.7	15.9
	21	196 21.3	178 08.8	· · 19.6	177 24.7	· · 47.8	126 53.1	· · 35.3	62 05.0	· · 15.8
	22	211 23.8	193 09.5	20.0	192 25.4	48.5	141 55.0	35.4	77 07.3	15.8
	23	226 26.3	208 10.1	20.4	207 26.1	49.3	156 56.8	35.5	92 09.6	15.7
24	00	241 28.7	223 10.8	N 6 20.9	222 26.8	N 6 50.0	171 58.7	N21 35.6	107 11.9	N18 15.7
	01	256 31.2	238 11.5	21.3	237 27.5	50.7	187 00.5	35.7	122 14.2	15.6
	02	271 33.7	253 12.2	21.7	252 28.2	51.4	202 02.3	35.8	137 16.4	15.6
	03	286 36.1	268 12.9	· · 22.2	267 28.9	· · 52.2	217 04.2	· · 35.8	152 18.7	· · 15.5
	04	301 38.6	283 13.6	22.6	282 29.6	52.9	232 06.0	35.9	167 21.0	15.5
	05	316 41.1	298 14.3	23.1	297 30.3	53.6	247 07.9	36.0	182 23.3	15.4
	06	331 43.5	313 14.9	N 6 23.5	312 31.0	N 6 54.3	262 09.7	N21 36.1	197 25.6	N18 15.4
	07	346 46.0	328 15.6	23.9	327 31.7	55.0	277 11.6	36.2	212 27.9	15.3
	08	1 48.5	343 16.3	24.4	342 32.4	55.8	292 13.4	36.3	227 30.2	15.3
T	09	16 50.9	358 17.0	· · 24.8	357 33.1	· · 56.5	307 15.3	· · 36.3	242 32.4	· · 15.2
U	10	31 53.4	13 17.7	25.3	12 33.8	57.2	322 17.1	36.4	257 34.7	15.2
E	11	46 55.8	28 18.3	25.7	27 34.5	57.9	337 19.0	36.5	272 37.0	15.1
S	12	61 58.3	43 19.0	N 6 26.2	42 35.2	N 6 58.6	352 20.8	N21 36.6	287 39.3	N18 15.1
D	13	77 00.8	58 19.7	26.6	57 35.9	6 59.4	7 22.7	36.7	302 41.6	15.0
A	14	92 03.2	73 20.3	27.0	72 36.6	7 00.1	22 24.5	36.8	317 43.9	15.0
Y	15	107 05.7	88 21.0	· · 27.5	87 37.3	· · 00.8	37 26.4	· · 36.9	332 46.1	· · 14.9
	16	122 08.2	103 21.7	27.9	102 38.1	01.5	52 28.2	36.9	347 48.4	14.9
	17	137 10.6	118 22.3	28.4	117 38.8	02.2	67 30.1	37.0	2 50.7	14.8
	18	152 13.1	133 23.0	N 6 28.8	132 39.5	N 7 03.0	82 31.9	N21 37.1	17 53.0	N18 14.8
	19	167 15.6	148 23.7	29.3	147 40.2	03.7	97 33.7	37.2	32 55.3	14.7
	20	182 18.0	163 24.3	29.7	162 40.9	04.4	112 35.6	37.3	47 57.5	14.7
	21	197 20.5	178 25.0	· · 30.2	177 41.6	· · 05.1	127 37.4	· · 37.4	62 59.8	· · 14.6
	22	212 23.0	193 25.6	30.6	192 42.3	05.8	142 39.3	37.4	78 02.1	14.6
	23	227 25.4	208 26.3	31.1	207 43.0	06.6	157 41.1	37.5	93 04.4	14.5
Mer. Pass.		h m 7 56.7	v 0.7	d 0.4	v 0.7	d 0.7	v 1.8	d 0.1	v 2.3	d 0.0

STARS		
Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 39.4	S40 23.7
Achernar	335 47.5	S57 21.0
Acrux	173 39.2	S62 58.7
Adhara	255 34.2	S28 56.7
Aldebaran	291 20.9	N16 27.7
Alioth	166 44.2	N56 05.1
Alkaid	153 19.9	N49 25.7
Al Na'ir	28 17.8	S47 04.0
Alnilam	276 14.3	S 1 13.1
Alphard	218 22.8	S 8 33.8
Alphecca	126 33.7	N26 47.5
Alpheratz	358 11.8	N28 57.8
Altair	62 34.5	N 8 48.5
Ankaa	353 42.8	S42 25.6
Antares	112 59.2	S26 22.9
Arcturus	146 20.2	N19 18.0
Atria	108 24.9	S68 59.1
Avior	234 29.4	S59 26.6
Bellatrix	279 01.5	N 6 19.6
Betelgeuse	271 31.0	N 7 24.0
Canopus	264 08.7	S52 41.3
Capella	281 15.1	N45 58.5
Deneb	49 49.8	N45 11.8
Denebola	183 01.2	N14 41.9
Diphda	349 23.4	S18 06.6
Dubhe	194 24.9	N61 52.6
Elnath	278 47.3	N28 35.2
Eltanin	90 58.3	N51 29.5
Enif	34 13.7	N 9 46.2
Fomalhaut	15 54.0	S29 44.4
Gacrux	172 30.8	S56 59.5
Gienah	176 20.1	S17 25.2
Hadar	149 25.9	S60 16.0
Hamal	328 31.7	N23 21.2
Kaus Aust.	84 19.5	S34 23.6
Kochab	137 17.9	N74 15.0
Markab	14 05.5	N15 04.9
Menkar	314 43.8	N 4 00.0
Menkent	148 39.3	S36 15.7
Miaplacidus	221 45.6	S69 37.9
Mirfak	309 19.8	N49 46.7
Nunki	76 31.7	S26 19.4
Peacock	54 01.7	S56 48.2
Pollux	244 01.2	N28 04.8
Procyon	245 28.4	N 5 16.8
Rasalhague	96 31.4	N12 34.6
Regulus	208 12.4	N12 04.6
Rigel	281 38.5	S 8 13.8
Rigil Kent.	140 28.1	S60 44.6
Sabik	102 43.4	S15 41.8
Schedar	350 11.8	N56 24.6
Shaula	96 58.4	S37 05.2
Sirius	258 58.0	S16 41.4
Spica	158 59.6	S11 02.7
Suhail	223 12.5	S43 20.8
Vega	80 57.0	N38 45.7
Zuben'ubi	137 35.2	S15 56.9

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	342 24.3	9 08
Mars	341 40.2	9 11
Jupiter	290 44.7	12 33
Saturn	225 47.4	16 52

G.M.T.	SUN G.H.A.	SUN Dec.	MOON G.H.A.	MOON *v*	MOON Dec.	MOON *d*	MOON H.P.
d h	° ′	° ′	° ′	′	° ′	′	′
22 00	180 51.8	N20 19.0	135 42.7	12.1	N17 43.2	3.4	54.5
01	195 51.7	19.5	150 13.8	12.2	17 39.8	3.4	54.5
02	210 51.7	20.0	164 45.0	12.2	17 36.4	3.6	54.5
03	225 51.7	·· 20.5	179 16.2	12.2	17 32.8	3.6	54.5
04	240 51.6	21.0	193 47.4	12.2	17 29.2	3.8	54.5
05	255 51.6	21.5	208 18.6	12.2	17 25.4	3.8	54.5
06	270 51.5	N20 21.9	222 49.8	12.2	N17 21.6	3.9	54.5
07	285 51.5	22.4	237 21.0	12.3	17 17.7	3.9	54.6
08	300 51.4	22.9	251 52.3	12.2	17 13.8	4.1	54.6
S 09	315 51.4	·· 23.4	266 23.5	12.2	17 09.7	4.1	54.6
U 10	330 51.3	23.9	280 54.7	12.3	17 05.6	4.2	54.6
N 11	345 51.3	24.4	295 26.0	12.2	17 01.4	4.3	54.6
D 12	0 51.2	N20 24.9	309 57.2	12.3	N16 57.1	4.4	54.6
A 13	15 51.2	25.4	324 28.5	12.2	16 52.7	4.5	54.7
Y 14	30 51.1	25.9	338 59.7	12.3	16 48.2	4.5	54.7
15	45 51.1	·· 26.4	353 31.0	12.3	16 43.7	4.6	54.7
16	60 51.0	26.9	8 02.3	12.3	16 39.1	4.7	54.7
17	75 51.0	27.3	22 33.6	12.3	16 34.4	4.8	54.7
18	90 50.9	N20 27.8	37 04.9	12.3	N16 29.6	4.9	54.7
19	105 50.9	28.3	51 36.2	12.3	16 24.7	4.9	54.8
20	120 50.9	28.8	66 07.5	12.3	16 19.8	5.0	54.8
21	135 50.8	·· 29.3	80 38.8	12.4	16 14.8	5.1	54.8
22	150 50.8	29.8	95 10.2	12.3	16 09.7	5.2	54.8
23	165 50.7	30.3	109 41.5	12.4	16 04.5	5.3	54.8
23 00	180 50.7	N20 30.7	124 12.9	12.3	N15 59.2	5.3	54.9
01	195 50.6	31.2	138 44.2	12.4	15 53.9	5.4	54.9
02	210 50.6	31.7	153 15.6	12.4	15 48.5	5.5	54.9
03	225 50.5	·· 32.2	167 47.0	12.3	15 43.0	5.5	54.9
04	240 50.4	32.7	182 18.3	12.4	15 37.5	5.7	54.9
05	255 50.4	33.1	196 49.7	12.4	15 31.8	5.7	55.0
06	270 50.3	N20 33.6	211 21.1	12.4	N15 26.1	5.8	55.0
07	285 50.3	34.1	225 52.5	12.4	15 20.3	5.8	55.0
08	300 50.2	34.6	240 23.9	12.5	15 14.5	6.0	55.0
M 09	315 50.2	·· 35.1	254 55.4	12.4	15 08.5	6.0	55.0
O 10	330 50.1	35.5	269 26.8	12.4	15 02.5	6.1	55.1
N 11	345 50.1	36.0	283 58.2	12.5	14 56.4	6.2	55.1
D 12	0 50.0	N20 36.5	298 29.7	12.4	N14 50.2	6.2	55.1
A 13	15 50.0	37.0	313 01.1	12.5	14 44.0	6.3	55.1
Y 14	30 49.9	37.4	327 32.6	12.4	14 37.7	6.4	55.1
15	45 49.9	·· 37.9	342 04.0	12.5	14 31.3	6.4	55.2
16	60 49.8	38.4	356 35.5	12.5	14 24.9	6.6	55.2
17	75 49.8	38.9	11 07.0	12.5	14 18.3	6.6	55.2
18	90 49.7	N20 39.3	25 38.5	12.4	N14 11.7	6.6	55.2
19	105 49.7	39.8	40 09.9	12.5	14 05.1	6.8	55.3
20	120 49.6	40.3	54 41.4	12.5	13 58.3	6.8	55.3
21	135 49.6	·· 40.8	69 12.9	12.5	13 51.5	6.9	55.3
22	150 49.5	41.2	83 44.4	12.6	13 44.6	6.9	55.3
23	165 49.4	41.7	98 16.0	12.5	13 37.7	7.0	55.4
24 00	180 49.4	N20 42.2	112 47.5	12.5	N13 30.7	7.1	55.4
01	195 49.3	42.6	127 19.0	12.5	13 23.6	7.2	55.4
02	210 49.3	43.1	141 50.5	12.6	13 16.4	7.2	55.4
03	225 49.2	·· 43.6	156 22.1	12.5	13 09.2	7.3	55.5
04	240 49.2	44.0	170 53.6	12.5	13 01.9	7.4	55.5
05	255 49.1	44.5	185 25.1	12.6	12 54.5	7.4	55.5
06	270 49.0	N20 45.0	199 56.7	12.5	N12 47.1	7.5	55.5
07	285 49.0	45.4	214 28.2	12.6	12 39.6	7.6	55.6
T 08	300 48.9	45.9	228 59.8	12.5	12 32.0	7.6	55.6
U 09	315 48.9	·· 46.4	243 31.3	12.6	12 24.4	7.7	55.6
E 10	330 48.8	46.8	258 02.9	12.5	12 16.7	7.7	55.6
S 11	345 48.8	47.3	272 34.4	12.6	12 09.0	7.9	55.7
D 12	0 48.7	N20 47.7	287 06.0	12.6	N12 01.1	7.9	55.7
A 13	15 48.6	48.2	301 37.6	12.5	11 53.2	7.9	55.7
Y 14	30 48.6	48.7	316 09.1	12.6	11 45.3	8.0	55.7
15	45 48.5	·· 49.1	330 40.7	12.5	11 37.3	8.1	55.8
16	60 48.5	49.6	345 12.2	12.6	11 29.2	8.1	55.8
17	75 48.4	50.0	359 43.8	12.6	11 21.1	8.2	55.8
18	90 48.4	N20 50.5	14 15.4	12.5	N11 12.9	8.3	55.9
19	105 48.3	50.9	28 46.9	12.6	11 04.6	8.3	55.9
20	120 48.2	51.4	43 18.5	12.5	10 56.3	8.4	55.9
21	135 48.2	·· 51.9	57 50.0	12.6	10 47.9	8.4	55.9
22	150 48.1	52.3	72 21.6	12.5	10 39.5	8.5	56.0
23	165 48.1	52.8	86 53.1	12.6	10 31.0	8.6	56.0
	S.D. 15.8	*d* 0.5	S.D. 14.9		15.0		15.2

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 22	Moonrise 23	Moonrise 24	Moonrise 25
°	h m	h m	h m	h m	h m	h m	h m
N 72	▭	▭	▭	04 07	06 05	07 53	09 38
N 70	▭	▭	▭	05 11	06 42	08 16	09 53
68	////	////	00 55	05 47	07 07	08 34	10 04
66	////	////	01 50	06 12	07 27	08 48	10 13
64	////	////	02 23	06 32	07 43	09 00	10 21
62	////	01 15	02 47	06 48	07 56	09 10	10 27
60	////	01 54	03 05	07 01	08 07	09 18	10 33
N 58	////	02 20	03 21	07 12	08 17	09 26	10 38
56	01 08	02 41	03 34	07 22	08 25	09 32	10 43
54	01 44	02 57	03 45	07 31	08 32	09 38	10 47
52	02 08	03 11	03 55	07 39	08 39	09 43	10 50
50	02 27	03 23	04 04	07 46	08 45	09 48	10 53
45	03 03	03 48	04 23	08 01	08 58	09 58	11 01
N 40	03 28	04 07	04 38	08 13	09 09	10 07	11 06
35	03 48	04 23	04 51	08 24	09 18	10 14	11 12
30	04 04	04 36	05 02	08 33	09 26	10 20	11 16
20	04 29	04 57	05 21	08 49	09 40	10 31	11 24
N 10	04 49	05 15	05 38	09 02	09 51	10 41	11 31
0	05 05	05 31	05 53	09 15	10 03	10 50	11 37
S 10	05 20	05 46	06 08	09 28	10 14	10 59	11 43
20	05 34	06 01	06 24	09 42	10 26	11 08	11 50
30	05 48	06 17	06 42	09 58	10 39	11 19	11 58
35	05 55	06 26	06 53	10 07	10 47	11 26	12 02
40	06 02	06 36	07 05	10 17	10 56	11 33	12 07
45	06 11	06 47	07 19	10 29	11 07	11 41	12 13
S 50	06 20	07 00	07 37	10 44	11 19	11 51	12 20
52	06 24	07 06	07 45	10 51	11 25	11 56	12 23
54	06 29	07 13	07 54	10 59	11 32	12 01	12 26
56	06 33	07 20	08 04	11 07	11 39	12 06	12 30
58	06 38	07 28	08 16	11 17	11 47	12 12	12 35
S 60	06 44	07 38	08 30	11 28	11 56	12 19	12 39

Lat.	Sunset	Twilight Civil	Twilight Naut.	Moonset 22	Moonset 23	Moonset 24	Moonset 25
°	h m	h m	h m	h m	h m	h m	h m
N 72	▭	▭	▭	02 06	01 47	01 37	01 29
N 70	▭	▭	▭	01 01	01 09	01 13	01 14
68	23 07	////	////	00 25	00 43	00 54	01 01
66	22 06	////	////	24 22	00 22	00 39	00 51
64	21 33	////	////	24 06	00 06	00 26	00 42
62	21 09	22 43	////	23 52	24 15	00 15	00 34
60	20 50	22 02	////	23 41	24 06	00 06	00 28
N 58	20 34	21 35	////	23 31	23 58	24 22	00 22
56	20 21	21 14	22 50	23 22	23 51	24 17	00 17
54	20 09	20 58	22 12	23 14	23 45	24 12	00 12
52	19 59	20 43	21 47	23 07	23 39	24 08	00 08
50	19 50	20 31	21 28	23 01	23 34	24 04	00 04
45	19 31	20 06	20 52	22 47	23 23	23 56	24 27
N 40	19 15	19 47	20 26	22 36	23 14	23 49	24 22
35	19 02	19 31	20 06	22 26	23 06	23 43	24 19
30	18 51	19 18	19 50	22 18	22 59	23 38	24 15
20	18 32	18 56	19 24	22 03	22 46	23 28	24 10
N 10	18 16	18 38	19 05	21 50	22 36	23 20	24 04
0	18 00	18 22	18 48	21 38	22 25	23 12	24 00
S 10	17 45	18 07	18 33	21 26	22 15	23 05	23 55
20	17 29	17 52	18 19	21 13	22 04	22 56	23 49
30	17 11	17 36	18 06	20 58	21 52	22 47	23 43
35	17 00	17 27	17 58	20 49	21 44	22 41	23 40
40	16 48	17 17	17 51	20 39	21 36	22 35	23 36
45	16 34	17 06	17 42	20 28	21 26	22 28	23 31
S 50	16 16	16 53	17 33	20 14	21 15	22 19	23 26
52	16 08	16 47	17 29	20 07	21 09	22 15	23 23
54	15 59	16 40	17 24	20 00	21 03	22 10	23 20
56	15 48	16 33	17 20	19 51	20 56	22 05	23 17
58	15 37	16 24	17 14	19 42	20 49	22 00	23 14
S 60	15 23	16 15	17 09	19 31	20 40	21 53	23 10

Day	SUN Eqn. of Time 00ʰ	SUN Eqn. of Time 12ʰ	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
	m s	m s	h m	h m	h m	d	
22	03 27	03 25	11 57	15 27	03 03	04	◐
23	03 23	03 20	11 57	16 14	03 50	05	
24	03 18	03 15	11 57	17 01	04 38	06	

1977 MAY 25, 26, 27 (WED., THURS., FRI.)

G.M.T.		ARIES	VENUS −4.1		MARS +1.3		JUPITER −1.5		SATURN +0.6	
		G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
d h		° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
25 00		242 27.9	223 27.0	N 6 31.6	222 43.7	N 7 07.3	172 43.0	N21 37.6	108 06.7	N18 14.5
01		257 30.3	238 27.6	32.0	237 44.4	08.0	187 44.8	37.7	123 08.9	14.4
02		272 32.8	253 28.3	32.5	252 45.1	08.7	202 46.7	37.8	138 11.2	14.4
03		287 35.3	268 28.9	·· 32.9	267 45.8	·· 09.4	217 48.5	·· 37.9	153 13.5	·· 14.3
04		302 37.7	283 29.6	33.4	282 46.5	10.2	232 50.4	37.9	168 15.8	14.3
05		317 40.2	298 30.2	33.8	297 47.2	10.9	247 52.2	38.0	183 18.1	14.2
06		332 42.7	313 30.9	N 6 34.3	312 47.9	N 7 11.6	262 54.1	N21 38.1	198 20.4	N18 14.2
07	W	347 45.1	328 31.5	34.8	327 48.6	12.3	277 55.9	38.2	213 22.6	14.1
08	E	2 47.6	343 32.2	35.2	342 49.3	13.0	292 57.8	38.3	228 24.9	14.1
09	D	17 50.1	358 32.8	·· 35.7	357 50.0	·· 13.8	307 59.6	·· 38.4	243 27.2	·· 14.0
10	N	32 52.5	13 33.4	36.1	12 50.7	14.5	323 01.5	38.5	258 29.5	14.0
11	E	47 55.0	28 34.1	36.6	27 51.5	15.2	338 03.3	38.5	273 31.8	13.9
12	S	62 57.4	43 34.7	N 6 37.1	42 52.2	N 7 15.9	353 05.1	N21 38.6	288 34.0	N18 13.9
13	D	77 59.9	58 35.4	37.5	57 52.9	16.6	8 07.0	38.7	303 36.3	13.8
14	A	93 02.4	73 36.0	38.0	72 53.6	17.3	23 08.8	38.8	318 38.6	13.8
15	Y	108 04.8	88 36.6	·· 38.5	87 54.3	·· 18.1	38 10.7	·· 38.9	333 40.9	·· 13.7
16		123 07.3	103 37.3	38.9	102 55.0	18.8	53 12.5	39.0	348 43.1	13.7
17		138 09.8	118 37.9	39.4	117 55.7	19.5	68 14.4	39.0	3 45.4	13.6
18		153 12.2	133 38.5	N 6 39.9	132 56.4	N 7 20.2	83 16.2	N21 39.1	18 47.7	N18 13.6
19		168 14.7	148 39.2	40.4	147 57.1	20.9	98 18.1	39.2	33 50.0	13.5
20		183 17.2	163 39.8	40.8	162 57.8	21.6	113 19.9	39.3	48 52.3	13.5
21		198 19.6	178 40.4	·· 41.3	177 58.5	·· 22.4	128 21.8	·· 39.4	63 54.5	·· 13.4
22		213 22.1	193 41.1	41.8	192 59.2	23.1	143 23.6	39.5	78 56.8	13.4
23		228 24.6	208 41.7	42.2	207 59.9	23.8	158 25.5	39.5	93 59.1	13.3
26 00		243 27.0	223 42.3	N 6 42.7	223 00.6	N 7 24.5	173 27.3	N21 39.6	109 01.4	N18 13.3
01		258 29.5	238 42.9	43.2	238 01.3	25.2	188 29.1	39.7	124 03.7	13.2
02		273 31.9	253 43.5	43.7	253 02.0	25.9	203 31.0	39.8	139 05.9	13.2
03		288 34.4	268 44.2	·· 44.2	268 02.7	·· 26.7	218 32.8	·· 39.9	154 08.2	·· 13.1
04		303 36.9	283 44.8	44.6	283 03.4	27.4	233 34.7	39.9	169 10.5	13.1
05		318 39.3	298 45.4	45.1	298 04.1	28.1	248 36.5	40.0	184 12.8	13.0
06		333 41.8	313 46.0	N 6 45.6	313 04.8	N 7 28.8	263 38.4	N21 40.1	199 15.0	N18 13.0
07		348 44.3	328 46.6	46.1	328 05.5	29.5	278 40.2	40.2	214 17.3	12.9
08	T	3 46.7	343 47.3	46.5	343 06.3	30.2	293 42.1	40.3	229 19.6	12.8
09	H	18 49.2	358 47.9	·· 47.0	358 07.0	·· 30.9	308 43.9	·· 40.4	244 21.9	·· 12.8
10	U	33 51.7	13 48.5	47.5	13 07.7	31.7	323 45.8	40.4	259 24.1	12.7
11	R	48 54.1	28 49.1	48.0	28 08.4	32.4	338 47.6	40.5	274 26.4	12.7
12	S	63 56.6	43 49.7	N 6 48.5	43 09.1	N 7 33.1	353 49.5	N21 40.6	289 28.7	N18 12.6
13	D	78 59.1	58 50.3	49.0	58 09.8	33.8	8 51.3	40.7	304 31.0	12.6
14	A	94 01.5	73 50.9	49.5	73 10.5	34.5	23 53.1	40.8	319 33.2	12.5
15	Y	109 04.0	88 51.5	·· 49.9	88 11.2	·· 35.2	38 55.0	·· 40.9	334 35.5	·· 12.5
16		124 06.4	103 52.1	50.4	103 11.9	35.9	53 56.8	40.9	349 37.8	12.4
17		139 08.9	118 52.7	50.9	118 12.6	36.7	68 58.7	41.0	4 40.1	12.4
18		154 11.4	133 53.3	N 6 51.4	133 13.3	N 7 37.4	84 00.5	N21 41.1	19 42.4	N18 12.3
19		169 13.8	148 53.9	51.9	148 14.0	38.1	99 02.4	41.2	34 44.6	12.3
20		184 16.3	163 54.5	52.4	163 14.7	38.8	114 04.2	41.3	49 46.9	12.2
21		199 18.8	178 55.1	·· 52.9	178 15.4	·· 39.5	129 06.1	·· 41.4	64 49.2	·· 12.2
22		214 21.2	193 55.7	53.4	193 16.1	40.2	144 07.9	41.4	79 51.5	12.1
23		229 23.7	208 56.3	53.9	208 16.8	40.9	159 09.8	41.5	94 53.7	12.1
27 00		244 26.2	223 56.9	N 6 54.4	223 17.5	N 7 41.6	174 11.6	N21 41.6	109 56.0	N18 12.0
01		259 28.6	238 57.5	54.9	238 18.2	42.4	189 13.4	41.7	124 58.3	12.0
02		274 31.1	253 58.1	55.3	253 18.9	43.1	204 15.3	41.8	140 00.5	11.9
03		289 33.5	268 58.7	·· 55.8	268 19.6	·· 43.8	219 17.1	·· 41.8	155 02.8	·· 11.8
04		304 36.0	283 59.3	56.3	283 20.3	44.5	234 19.0	41.9	170 05.1	11.8
05		319 38.5	298 59.8	56.8	298 21.0	45.2	249 20.8	42.0	185 07.4	11.7
06		334 40.9	314 00.4	N 6 57.3	313 21.7	N 7 45.9	264 22.7	N21 42.1	200 09.6	N18 11.7
07		349 43.4	329 01.0	57.8	328 22.5	46.6	279 24.5	42.2	215 11.9	11.6
08		4 45.9	344 01.6	58.3	343 23.2	47.3	294 26.4	42.3	230 14.2	11.6
09	F	19 48.3	359 02.2	·· 58.8	358 23.9	·· 48.0	309 28.2	·· 42.3	245 16.5	·· 11.5
10	R	34 50.8	14 02.8	59.3	13 24.6	48.8	324 30.1	42.4	260 18.7	11.5
11	I	49 53.3	29 03.3	6 59.8	28 25.3	49.5	339 31.9	42.5	275 21.0	11.4
12	D	64 55.7	44 03.9	N 7 00.3	43 26.0	N 7 50.2	354 33.7	N21 42.6	290 23.3	N18 11.4
13	A	79 58.2	59 04.5	00.8	58 26.7	50.9	9 35.6	42.7	305 25.6	11.3
14	Y	95 00.7	74 05.1	01.4	73 27.4	51.6	24 37.4	42.7	320 27.8	11.3
15		110 03.1	89 05.6	·· 01.9	88 28.1	·· 52.3	39 39.3	·· 42.8	335 30.1	·· 11.2
16		125 05.6	104 06.2	02.4	103 28.8	53.0	54 41.1	42.9	350 32.4	11.2
17		140 08.0	119 06.8	02.9	118 29.5	53.7	69 43.0	43.0	5 34.6	11.1
18		155 10.5	134 07.4	N 7 03.4	133 30.2	N 7 54.4	84 44.8	N21 43.1	20 36.9	N18 11.1
19		170 13.0	149 07.9	03.9	148 30.9	55.1	99 46.7	43.2	35 39.2	11.0
20		185 15.4	164 08.5	04.4	163 31.6	55.8	114 48.5	43.2	50 41.5	10.9
21		200 17.9	179 09.1	·· 04.9	178 32.3	·· 56.6	129 50.4	·· 43.3	65 43.7	·· 10.9
22		215 20.4	194 09.6	05.4	193 33.0	57.3	144 52.2	43.4	80 46.0	10.8
23		230 22.8	209 10.2	05.9	208 33.7	58.0	159 54.0	43.5	95 48.3	10.8
Mer. Pass.		h m 7 44.9	v 0.6	d 0.5	v 0.7	d 0.7	v 1.8	d 0.1	v 2.3	d 0.1

STARS		
Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 39.4	S40 23.7
Achernar	335 47.5	S57 20.9
Acrux	173 39.2	S62 58.8
Adhara	255 34.2	S28 56.7
Aldebaran	291 20.9	N16 27.7
Alioth	166 44.2	N56 05.1
Alkaid	153 19.9	N49 25.7
Al Na'ir	28 17.8	S47 04.0
Alnilam	276 14.3	S 1 13.1
Alphard	218 22.8	S 8 33.8
Alphecca	126 33.7	N26 47.5
Alpheratz	358 11.8	N28 57.8
Altair	62 34.5	N 8 48.5
Ankaa	353 42.7	S42 25.5
Antares	112 59.2	S26 22.9
Arcturus	146 20.2	N19 18.0
Atria	108 24.9	S68 59.2
Avior	234 29.4	S59 26.6
Bellatrix	279 01.5	N 6 19.6
Betelgeuse	271 31.0	N 7 24.1
Canopus	264 08.7	S52 41.3
Capella	281 15.1	N45 58.5
Deneb	49 49.7	N45 11.8
Denebola	183 01.2	N14 41.9
Diphda	349 23.3	S18 06.6
Dubhe	194 24.9	N61 52.6
Elnath	278 47.3	N28 35.2
Eltanin	90 58.3	N51 29.5
Enif	34 13.7	N 9 46.3
Fomalhaut	15 54.0	S29 44.3
Gacrux	172 30.8	S56 59.5
Gienah	176 20.1	S17 25.2
Hadar	149 25.9	S60 16.0
Hamal	328 31.7	N23 21.2
Kaus Aust.	84 19.5	S34 23.6
Kochab	137 17.9	N74 15.1
Markab	14 05.4	N15 04.9
Menkar	314 43.8	N 4 00.0
Menkent	148 39.3	S36 15.7
Miaplacidus	221 45.6	S69 37.9
Mirfak	309 19.8	N49 46.7
Nunki	76 31.7	S26 19.4
Peacock	54 01.7	S56 48.2
Pollux	244 01.2	N28 04.8
Procyon	245 28.4	N 5 16.9
Rasalhague	96 31.3	N12 34.6
Regulus	208 12.4	N12 04.6
Rigel	281 38.5	S 8 13.8
Rigil Kent.	140 28.2	S60 44.6
Sabik	102 43.4	S15 41.8
Schedar	350 11.8	N56 24.6
Shaula	96 58.4	S37 05.2
Sirius	258 58.0	S16 41.3
Spica	158 59.7	S11 02.7
Suhail	223 12.5	S43 20.8
Vega	80 57.0	N38 45.7
Zuben'ubi	137 35.2	S15 56.9

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	340 15.3	9 05
Mars	339 33.6	9 08
Jupiter	290 00.3	12 25
Saturn	225 34.4	16 41

G.M.T.			SUN		MOON				
			G.H.A.	Dec.	G.H.A.	*v*	Dec.	*d*	H.P.
d		h	° ′	° ′	° ′	′	° ′	′	′
25		00	180 48.0	N20 53.2	101 24.7	12.5	N10 22.4	8.6	56.0
		01	195 47.9	53.7	115 56.2	12.6	10 13.8	8.7	56.1
		02	210 47.9	54.1	130 27.8	12.5	10 05.1	8.7	56.1
		03	225 47.8	·· 54.6	144 59.3	12.5	9 56.4	8.8	56.1
		04	240 47.8	55.0	159 30.8	12.6	9 47.6	8.8	56.2
		05	255 47.7	55.5	174 02.4	12.5	9 38.8	8.9	56.2
		06	270 47.6	N20 55.9	188 33.9	12.5	N 9 29.9	9.0	56.2
		07	285 47.6	56.4	203 05.4	12.5	9 20.9	9.0	56.3
	W	08	300 47.5	56.8	217 36.9	12.5	9 11.9	9.0	56.3
	E	09	315 47.4	·· 57.3	232 08.4	12.5	9 02.9	9.1	56.3
	D	10	330 47.4	57.7	246 39.9	12.5	8 53.8	9.2	56.3
	N	11	345 47.3	58.2	261 11.4	12.4	8 44.6	9.2	56.4
	E	12	0 47.3	N20 58.6	275 42.8	12.5	N 8 35.4	9.3	56.4
	S	13	15 47.2	59.1	290 14.3	12.5	8 26.1	9.3	56.4
	D	14	30 47.1	20 59.5	304 45.8	12.4	8 16.8	9.4	56.5
	A	15	45 47.1	21 00.0	319 17.2	12.4	8 07.4	9.4	56.5
	Y	16	60 47.0	00.4	333 48.6	12.4	7 58.0	9.5	56.5
		17	75 46.9	00.8	348 20.0	12.5	7 48.5	9.5	56.6
		18	90 46.9	N21 01.3	2 51.5	12.3	N 7 39.0	9.6	56.6
		19	105 46.8	01.7	17 22.8	12.4	7 29.4	9.6	56.6
		20	120 46.7	02.2	31 54.2	12.4	7 19.8	9.6	56.7
		21	135 46.7	·· 02.6	46 25.6	12.3	7 10.2	9.7	56.7
		22	150 46.6	03.0	60 56.9	12.4	7 00.5	9.8	56.7
		23	165 46.6	03.5	75 28.3	12.3	6 50.7	9.8	56.8
26		00	180 46.5	N21 03.9	89 59.6	12.3	N 6 40.9	9.8	56.8
		01	195 46.4	04.4	104 30.9	12.3	6 31.1	9.9	56.8
		02	210 46.4	04.8	119 02.2	12.2	6 21.2	10.0	56.9
		03	225 46.3	·· 05.2	133 33.4	12.3	6 11.2	9.9	56.9
		04	240 46.2	05.7	148 04.7	12.2	6 01.3	10.0	57.0
		05	255 46.2	06.1	162 35.9	12.2	5 51.3	10.1	57.0
		06	270 46.1	N21 06.5	177 07.1	12.2	N 5 41.2	10.1	57.0
		07	285 46.0	07.0	191 38.3	12.2	5 31.1	10.1	57.1
	T	08	300 46.0	07.4	206 09.5	12.1	5 21.0	10.2	57.1
	H	09	315 45.9	·· 07.8	220 40.6	12.1	5 10.8	10.2	57.1
	U	10	330 45.8	08.3	235 11.7	12.1	5 00.6	10.3	57.2
	R	11	345 45.8	08.7	249 42.8	12.1	4 50.3	10.3	57.2
	S	12	0 45.7	N21 09.1	264 13.9	12.0	N 4 40.0	10.3	57.2
	D	13	15 45.6	09.6	278 44.9	12.1	4 29.7	10.4	57.3
	A	14	30 45.6	10.0	293 16.0	12.0	4 19.3	10.4	57.3
	Y	15	45 45.5	·· 10.4	307 47.0	11.9	4 08.9	10.4	57.3
		16	60 45.4	10.9	322 17.9	12.0	3 58.5	10.4	57.4
		17	75 45.3	11.3	336 48.9	11.9	3 48.1	10.5	57.4
		18	90 45.3	N21 11.7	351 19.8	11.9	N 3 37.6	10.6	57.5
		19	105 45.2	12.1	5 50.7	11.8	3 27.0	10.5	57.5
		20	120 45.1	12.6	20 21.5	11.8	3 16.5	10.6	57.5
		21	135 45.1	·· 13.0	34 52.3	11.8	3 05.9	10.7	57.6
		22	150 45.0	13.4	49 23.1	11.8	2 55.2	10.6	57.6
		23	165 44.9	13.8	63 53.9	11.7	2 44.6	10.7	57.6
27		00	180 44.9	N21 14.3	78 24.6	11.7	N 2 33.9	10.7	57.7
		01	195 44.8	14.7	92 55.3	11.6	2 23.2	10.7	57.7
		02	210 44.7	15.1	107 25.9	11.7	2 12.5	10.8	57.8
		03	225 44.6	·· 15.5	121 56.6	11.6	2 01.7	10.8	57.8
		04	240 44.6	16.0	136 27.2	11.5	1 50.9	10.8	57.8
		05	255 44.5	16.4	150 57.7	11.5	1 40.1	10.8	57.9
		06	270 44.4	N21 16.8	165 28.2	11.5	N 1 29.3	10.9	57.9
		07	285 44.4	17.2	179 58.7	11.4	1 18.4	10.8	58.0
		08	300 44.3	17.6	194 29.1	11.4	1 07.6	10.9	58.0
	F	09	315 44.2	·· 18.1	208 59.5	11.4	0 56.7	11.0	58.0
	R	10	330 44.1	18.5	223 29.9	11.3	0 45.7	10.9	58.1
	I	11	345 44.1	18.9	238 00.2	11.3	0 34.8	11.0	58.1
	D	12	0 44.0	N21 19.3	252 30.5	11.2	N 0 23.8	10.9	58.1
	A	13	15 43.9	19.7	267 00.7	11.2	0 12.9	11.0	58.2
	Y	14	30 43.9	20.1	281 30.9	11.1	N 0 01.9	11.0	58.2
		15	45 43.8	·· 20.5	296 01.0	11.1	S 0 09.1	11.0	58.3
		16	60 43.7	21.0	310 31.1	11.1	0 20.1	11.1	58.3
		17	75 43.6	21.4	325 01.2	11.0	0 31.2	11.0	58.3
		18	90 43.6	N21 21.8	339 31.2	10.9	S 0 42.2	11.1	58.4
		19	105 43.5	22.2	354 01.1	10.9	0 53.3	11.0	58.4
		20	120 43.4	22.6	8 31.0	10.9	1 04.3	11.1	58.5
		21	135 43.3	·· 23.0	23 00.9	10.8	1 15.4	11.1	58.5
		22	150 43.3	23.4	37 30.7	10.8	1 26.5	11.1	58.5
		23	165 43.2	23.8	52 00.5	10.7	1 37.6	11.1	58.6
			S.D. 15.8	*d* 0.4	S.D. 15.4		15.6		15.8

Lat.	Twilight		Sunrise	Moonrise			
	Naut.	Civil		25	26	27	28
°	h m	h m	h m	h m	h m	h m	h m
N 72	▭	▭	▭	09 38	11 24	13 12	15 04
N 70	▭	▭	▭	09 53	11 31	13 12	14 57
68	////	////	00 20	10 04	11 36	13 12	14 52
66	////	////	01 38	10 13	11 41	13 12	14 47
64	////	////	02 14	10 21	11 45	13 12	14 43
62	////	00 59	02 40	10 27	11 48	13 12	14 40
60	////	01 45	02 59	10 33	11 51	13 12	14 37
N 58	////	02 13	03 16	10 38	11 54	13 12	14 34
56	00 53	02 35	03 30	10 43	11 56	13 12	14 32
54	01 35	02 52	03 41	10 47	11 58	13 12	14 30
52	02 02	03 07	03 52	10 50	12 00	13 12	14 28
50	02 22	03 20	04 01	10 53	12 02	13 12	14 26
45	02 59	03 45	04 21	11 01	12 05	13 12	14 22
N 40	03 25	04 05	04 36	11 06	12 08	13 13	14 19
35	03 46	04 21	04 50	11 12	12 11	13 13	14 16
30	04 02	04 34	05 01	11 16	12 13	13 13	14 14
20	04 28	04 57	05 21	11 24	12 17	13 13	14 10
N 10	04 48	05 15	05 38	11 31	12 21	13 13	14 07
0	05 05	05 31	05 53	11 37	12 24	13 13	14 03
S 10	05 21	05 46	06 09	11 43	12 28	13 13	14 00
20	05 35	06 02	06 25	11 50	12 31	13 13	13 57
30	05 49	06 18	06 44	11 58	12 35	13 13	13 53
35	05 57	06 28	06 55	12 02	12 38	13 14	13 51
40	06 04	06 38	07 08	12 07	12 40	13 14	13 48
45	06 13	06 50	07 22	12 13	12 43	13 14	13 46
S 50	06 23	07 03	07 40	12 20	12 47	13 14	13 42
52	06 27	07 10	07 49	12 23	12 49	13 14	13 41
54	06 32	07 17	07 58	12 26	12 51	13 14	13 39
56	06 37	07 24	08 09	12 30	12 53	13 14	13 37
58	06 42	07 33	08 21	12 35	12 55	13 15	13 35
S 60	06 48	07 43	08 36	12 39	12 57	13 15	13 33

Lat.	Sunset	Twilight		Moonset			
		Civil	Naut.	25	26	27	28
°	h m	h m	h m	h m	h m	h m	h m
N 72	▭	▭	▭	01 29	01 22	01 16	01 09
N 70	▭	▭	▭	01 14	01 14	01 13	01 12
68	▭	▭	▭	01 01	01 06	01 11	01 15
66	22 19	////	////	00 51	01 00	01 09	01 17
64	21 42	////	////	00 42	00 55	01 07	01 18
62	21 16	23 00	////	00 34	00 50	01 05	01 20
60	20 56	22 12	////	00 28	00 46	01 04	01 21
N 58	20 39	21 43	////	00 22	00 43	01 03	01 22
56	20 25	21 21	23 06	00 17	00 40	01 02	01 23
54	20 13	21 03	22 21	00 12	00 37	01 01	01 24
52	20 03	20 48	21 54	00 08	00 34	01 00	01 25
50	19 53	20 35	21 33	00 04	00 32	00 59	01 26
45	19 34	20 10	20 56	24 27	00 27	00 57	01 28
N 40	19 18	19 50	20 29	24 22	00 22	00 56	01 29
35	19 05	19 33	20 09	24 19	00 19	00 54	01 30
30	18 53	19 20	19 52	24 15	00 15	00 53	01 32
20	18 33	18 57	19 26	24 10	00 10	00 51	01 33
N 10	18 16	18 39	19 06	24 04	00 04	00 49	01 35
0	18 01	18 23	18 49	24 00	00 00	00 47	01 37
S 10	17 45	18 07	18 33	23 55	24 46	00 46	01 38
20	17 28	17 52	18 19	23 49	24 44	00 44	01 40
30	17 09	17 35	18 05	23 43	24 41	00 41	01 42
35	16 59	17 26	17 57	23 40	24 40	00 40	01 43
40	16 46	17 16	17 49	23 36	24 39	00 39	01 44
45	16 31	17 04	17 40	23 31	24 37	00 37	01 45
S 50	16 13	16 50	17 31	23 26	24 35	00 35	01 47
52	16 05	16 44	17 26	23 23	24 34	00 34	01 48
54	15 55	16 37	17 21	23 20	24 33	00 33	01 48
56	15 44	16 29	17 16	23 17	24 32	00 32	01 49
58	15 32	16 20	17 11	23 14	24 30	00 30	01 50
S 60	15 18	16 11	17 05	23 10	24 29	00 29	01 52

Day	SUN			MOON			
	Eqn. of Time		Mer. Pass.	Mer. Pass.		Age	Phase
	00ʰ	12ʰ		Upper	Lower		
	m s	m s	h m	h m	h m	d	
25	03 12	03 09	11 57	17 48	05 25	07	◐
26	03 06	03 03	11 57	18 36	06 12	08	
27	03 00	02 56	11 57	19 25	07 00	09	

1977 MAY 28, 29, 30 (SAT., SUN., MON.)

G.M.T.	ARIES	VENUS −4.1		MARS +1.3		JUPITER −1.5		SATURN +0.6	
	G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
d h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
28 00	245 25.3	224 10.7	N 7 06.4	223 34.4	N 7 58.7	174 55.9	N21 43.6	110 50.5	N18 10.7
01	260 27.8	239 11.3	07.0	238 35.1	7 59.4	189 57.7	43.6	125 52.8	10.7
02	275 30.2	254 11.9	07.5	253 35.8	8 00.1	204 59.6	43.7	140 55.1	10.6
03	290 32.7	269 12.4	·· 08.0	268 36.5	·· 00.8	220 01.4	·· 43.8	155 57.4	·· 10.6
04	305 35.2	284 13.0	08.5	283 37.2	01.5	235 03.3	43.9	170 59.6	10.5
05	320 37.6	299 13.5	09.0	298 37.9	02.2	250 05.1	44.0	186 01.9	10.5
06	335 40.1	314 14.1	N 7 09.5	313 38.6	N 8 02.9	265 07.0	N21 44.0	201 04.2	N18 10.4
07	350 42.5	329 14.7	10.0	328 39.3	03.6	280 08.8	44.1	216 06.4	10.4
S 08	5 45.0	344 15.2	10.6	343 40.0	04.3	295 10.6	44.2	231 08.7	10.3
A 09	20 47.5	359 15.8	·· 11.1	358 40.8	·· 05.1	310 12.5	·· 44.3	246 11.0	·· 10.2
T 10	35 49.9	14 16.3	11.6	13 41.5	05.8	325 14.3	44.4	261 13.2	10.2
U 11	50 52.4	29 16.9	12.1	28 42.2	06.5	340 16.2	44.4	276 15.5	10.1
R 12	65 54.9	44 17.4	N 7 12.6	43 42.9	N 8 07.2	355 18.0	N21 44.5	291 17.8	N18 10.1
D 13	80 57.3	59 18.0	13.2	58 43.6	07.9	10 19.9	44.6	306 20.1	10.0
A 14	95 59.8	74 18.5	13.7	73 44.3	08.6	25 21.7	44.7	321 22.3	10.0
Y 15	111 02.3	89 19.0	·· 14.2	88 45.0	·· 09.3	40 23.6	·· 44.8	336 24.6	·· 09.9
16	126 04.7	104 19.6	14.7	103 45.7	10.0	55 25.4	44.8	351 26.9	09.9
17	141 07.2	119 20.1	15.3	118 46.4	10.7	70 27.2	44.9	6 29.1	09.8
18	156 09.6	134 20.7	N 7 15.8	133 47.1	N 8 11.4	85 29.1	N21 45.0	21 31.4	N18 09.8
19	171 12.1	149 21.2	16.3	148 47.8	12.1	100 30.9	45.1	36 33.7	09.7
20	186 14.6	164 21.8	16.8	163 48.5	12.8	115 32.8	45.2	51 35.9	09.6
21	201 17.0	179 22.3	·· 17.4	178 49.2	·· 13.5	130 34.6	·· 45.3	66 38.2	·· 09.6
22	216 19.5	194 22.8	17.9	193 49.9	14.2	145 36.5	45.3	81 40.5	09.5
23	231 22.0	209 23.4	18.4	208 50.6	14.9	160 38.3	45.4	96 42.7	09.5
29 00	246 24.4	224 23.9	N 7 18.9	223 51.3	N 8 15.6	175 40.2	N21 45.5	111 45.0	N18 09.4
01	261 26.9	239 24.4	19.5	238 52.0	16.3	190 42.0	45.6	126 47.3	09.4
02	276 29.4	254 25.0	20.0	253 52.7	17.0	205 43.8	45.7	141 49.5	09.3
03	291 31.8	269 25.5	·· 20.5	268 53.4	·· 17.7	220 45.7	·· 45.7	156 51.8	·· 09.3
04	306 34.3	284 26.0	21.1	283 54.1	18.4	235 47.5	45.8	171 54.1	09.2
05	321 36.8	299 26.5	21.6	298 54.8	19.2	250 49.4	45.9	186 56.3	09.2
06	336 39.2	314 27.1	N 7 22.1	313 55.5	N 8 19.9	265 51.2	N21 46.0	201 58.6	N18 09.1
07	351 41.7	329 27.6	22.7	328 56.2	20.6	280 53.1	46.1	217 00.9	09.0
08	6 44.1	344 28.1	23.2	343 56.9	21.3	295 54.9	46.1	232 03.1	09.0
S 09	21 46.6	359 28.6	·· 23.7	358 57.6	·· 22.0	310 56.8	·· 46.2	247 05.4	·· 08.9
U 10	36 49.1	14 29.2	24.3	13 58.3	22.7	325 58.6	46.3	262 07.7	08.9
N 11	51 51.5	29 29.7	24.8	28 59.0	23.4	341 00.4	46.4	277 09.9	08.8
D 12	66 54.0	44 30.2	N 7 25.3	43 59.7	N 8 24.1	356 02.3	N21 46.5	292 12.2	N18 08.8
A 13	81 56.5	59 30.7	25.9	59 00.4	24.8	11 04.1	46.5	307 14.5	08.7
Y 14	96 58.9	74 31.2	26.4	74 01.1	25.5	26 06.0	46.6	322 16.7	08.7
15	112 01.4	89 31.8	·· 27.0	89 01.8	·· 26.2	41 07.8	·· 46.7	337 19.0	·· 08.6
16	127 03.9	104 32.3	27.5	104 02.6	26.9	56 09.7	46.8	352 21.3	08.5
17	142 06.3	119 32.8	28.0	119 03.3	27.6	71 11.5	46.9	7 23.5	08.5
18	157 08.8	134 33.3	N 7 28.6	134 04.0	N 8 28.3	86 13.4	N21 46.9	22 25.8	N18 08.4
19	172 11.3	149 33.8	29.1	149 04.7	29.0	101 15.2	47.0	37 28.1	08.4
20	187 13.7	164 34.3	29.7	164 05.4	29.7	116 17.0	47.1	52 30.3	08.3
21	202 16.2	179 34.8	·· 30.2	179 06.1	·· 30.4	131 18.9	·· 47.2	67 32.6	·· 08.3
22	217 18.6	194 35.3	30.8	194 06.8	31.1	146 20.7	47.2	82 34.9	08.2
23	232 21.1	209 35.8	31.3	209 07.5	31.8	161 22.6	47.3	97 37.1	08.2
30 00	247 23.6	224 36.4	N 7 31.9	224 08.2	N 8 32.5	176 24.4	N21 47.4	112 39.4	N18 08.1
01	262 26.0	239 36.9	32.4	239 08.9	33.2	191 26.3	47.5	127 41.7	08.0
02	277 28.5	254 37.4	32.9	254 09.6	33.9	206 28.1	47.6	142 43.9	08.0
03	292 31.0	269 37.9	·· 33.5	269 10.3	·· 34.6	221 29.9	·· 47.6	157 46.2	·· 07.9
04	307 33.4	284 38.4	34.0	284 11.0	35.3	236 31.8	47.7	172 48.5	07.9
05	322 35.9	299 38.9	34.6	299 11.7	36.0	251 33.6	47.8	187 50.7	07.8
06	337 38.4	314 39.4	N 7 35.1	314 12.4	N 8 36.7	266 35.5	N21 47.9	202 53.0	N18 07.8
07	352 40.8	329 39.9	35.7	329 13.1	37.4	281 37.3	48.0	217 55.2	07.7
08	7 43.3	344 40.4	36.2	344 13.8	38.1	296 39.2	48.0	232 57.5	07.7
M 09	22 45.7	359 40.8	·· 36.8	359 14.5	·· 38.8	311 41.0	·· 48.1	247 59.8	·· 07.6
O 10	37 48.2	14 41.3	37.3	14 15.2	39.5	326 42.9	48.2	263 02.0	07.5
N 11	52 50.7	29 41.8	37.9	29 15.9	40.2	341 44.7	48.3	278 04.3	07.5
D 12	67 53.1	44 42.3	N 7 38.4	44 16.6	N 8 40.9	356 46.5	N21 48.4	293 06.6	N18 07.4
A 13	82 55.6	59 42.8	39.0	59 17.3	41.6	11 48.4	48.4	308 08.8	07.4
Y 14	97 58.1	74 43.3	39.6	74 18.0	42.3	26 50.2	48.5	323 11.1	07.3
15	113 00.5	89 43.8	·· 40.1	89 18.7	·· 43.0	41 52.1	·· 48.6	338 13.3	·· 07.3
16	128 03.0	104 44.3	40.7	104 19.4	43.7	56 53.9	48.7	353 15.6	07.2
17	143 05.5	119 44.8	41.2	119 20.1	44.4	71 55.8	48.7	8 17.9	07.2
18	158 07.9	134 45.3	N 7 41.8	134 20.8	N 8 45.1	86 57.6	N21 48.8	23 20.1	N18 07.1
19	173 10.4	149 45.7	42.3	149 21.5	45.8	101 59.4	48.9	38 22.4	07.0
20	188 12.9	164 46.2	42.9	164 22.2	46.5	117 01.3	49.0	53 24.7	07.0
21	203 15.3	179 46.7	·· 43.5	179 22.9	·· 47.2	132 03.1	·· 49.1	68 26.9	·· 06.9
22	218 17.8	194 47.2	44.0	194 23.6	47.9	147 05.0	49.1	83 29.2	06.9
23	233 20.2	209 47.7	44.6	209 24.3	48.6	162 06.8	49.2	98 31.4	06.8
Mer. Pass.	h m 7 33.1	*v* 0.5	*d* 0.5	*v* 0.7	*d* 0.7	*v* 1.8	*d* 0.1	*v* 2.3	*d* 0.1

STARS

Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 39.4	S40 23.7
Achernar	335 47.5	S57 20.9
Acrux	173 39.3	S62 58.8
Adhara	255 34.2	S28 56.7
Aldebaran	291 20.9	N16 27.7
Alioth	166 44.2	N56 05.1
Alkaid	153 20.0	N49 25.7
Al Na'ir	28 17.7	S47 04.0
Alnilam	276 14.3	S 1 13.1
Alphard	218 22.9	S 8 33.8
Alphecca	126 33.7	N26 47.5
Alpheratz	358 11.7	N28 57.8
Altair	62 34.5	N 8 48.5
Ankaa	353 42.7	S42 25.5
Antares	112 59.2	S26 22.9
Arcturus	146 20.2	N19 18.0
Atria	108 24.9	S68 59.2
Avior	234 29.4	S59 26.6
Bellatrix	279 01.5	N 6 19.6
Betelgeuse	271 31.0	N 7 24.1
Canopus	264 08.7	S52 41.3
Capella	281 15.1	N45 58.5
Deneb	49 49.7	N45 11.8
Denebola	183 01.2	N14 41.9
Diphda	349 23.3	S18 06.6
Dubhe	194 24.9	N61 52.6
Elnath	278 47.3	N28 35.2
Eltanin	90 58.3	N51 29.5
Enif	34 13.7	N 9 46.3
Fomalhaut	15 53.9	S29 44.3
Gacrux	172 30.8	S56 59.5
Gienah	176 20.1	S17 25.2
Hadar	149 25.9	S60 16.0
Hamal	328 31.7	N23 21.2
Kaus Aust.	84 19.5	S34 23.6
Kochab	137 18.0	N74 15.1
Markab	14 05.4	N15 04.9
Menkar	314 43.8	N 4 00.0
Menkent	148 39.3	S36 15.7
Miaplacidus	221 45.6	S69 37.9
Mirfak	309 19.7	N49 46.7
Nunki	76 31.6	S26 19.4
Peacock	54 01.6	S56 48.2
Pollux	244 01.2	N28 04.8
Procyon	245 28.4	N 5 16.9
Rasalhague	96 31.3	N12 34.6
Regulus	208 12.4	N12 04.6
Rigel	281 38.5	S 8 13.8
Rigil Kent.	140 28.2	S60 44.6
Sabik	102 43.3	S15 41.8
Schedar	350 11.8	N56 24.6
Shaula	96 58.4	S37 05.2
Sirius	258 58.0	S16 41.3
Spica	158 59.7	S11 02.7
Suhail	223 12.6	S43 20.8
Vega	80 57.0	N38 45.7
Zuben'ubi	137 35.2	S15 56.9

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	337 59.5	9 02
Mars	337 26.9	9 04
Jupiter	289 15.7	12 16
Saturn	225 20.6	16 31

G.M.T.	SUN G.H.A.	SUN Dec.	MOON G.H.A.	MOON v	MOON Dec.	MOON d	MOON H.P.
d h	° ′	° ′	° ′	′	° ′	′	′
28 00	180 43.1	N21 24.2	66 30.2	10.6	S 1 48.7	11.1	58.6
01	195 43.0	24.7	80 59.8	10.6	1 59.8	11.1	58.6
02	210 43.0	25.1	95 29.4	10.6	2 10.9	11.1	58.7
03	225 42.9	· · 25.5	109 59.0	10.5	2 22.0	11.1	58.7
04	240 42.8	25.9	124 28.5	10.4	2 33.1	11.1	58.8
05	255 42.7	26.3	138 57.9	10.4	2 44.2	11.1	58.8
06	270 42.7	N21 26.7	153 27.3	10.3	S 2 55.3	11.2	58.8
07	285 42.6	27.1	167 56.6	10.3	3 06.5	11.1	58.9
S 08	300 42.5	27.5	182 25.9	10.2	3 17.6	11.1	58.9
A 09	315 42.4	· · 27.9	196 55.1	10.2	3 28.7	11.1	59.0
T 10	330 42.4	28.3	211 24.3	10.1	3 39.8	11.1	59.0
U 11	345 42.3	28.7	225 53.4	10.0	3 50.9	11.1	59.0
R 12	0 42.2	N21 29.1	240 22.4	10.0	S 4 02.0	11.1	59.1
D 13	15 42.1	29.5	254 51.4	9.9	4 13.1	11.0	59.1
A 14	30 42.1	29.9	269 20.3	9.9	4 24.1	11.1	59.1
Y 15	45 42.0	· · 30.3	283 49.2	9.8	4 35.2	11.1	59.2
16	60 41.9	30.7	298 18.0	9.7	4 46.3	11.0	59.2
17	75 41.8	31.1	312 46.7	9.6	4 57.3	11.0	59.3
18	90 41.7	N21 31.5	327 15.3	9.6	S 5 08.3	11.1	59.3
19	105 41.7	31.9	341 43.9	9.6	5 19.4	11.0	59.3
20	120 41.6	32.3	356 12.5	9.4	5 30.4	10.9	59.4
21	135 41.5	· · 32.7	10 40.9	9.4	5 41.3	11.0	59.4
22	150 41.4	33.1	25 09.3	9.4	5 52.3	10.9	59.5
23	165 41.3	33.5	39 37.7	9.2	6 03.2	11.0	59.5
29 00	180 41.3	N21 33.8	54 05.9	9.2	S 6 14.2	10.9	59.5
01	195 41.2	34.2	68 34.1	9.2	6 25.1	10.8	59.6
02	210 41.1	34.6	83 02.3	9.0	6 35.9	10.9	59.6
03	225 41.0	· · 35.0	97 30.3	9.0	6 46.8	10.8	59.6
04	240 40.9	35.4	111 58.3	8.9	6 57.6	10.8	59.7
05	255 40.9	35.8	126 26.2	8.9	7 08.4	10.8	59.7
06	270 40.8	N21 36.2	140 54.1	8.8	S 7 19.2	10.7	59.7
07	285 40.7	36.6	155 21.9	8.7	7 29.9	10.7	59.8
08	300 40.6	37.0	169 49.6	8.6	7 40.6	10.7	59.8
S 09	315 40.5	· · 37.4	184 17.2	8.6	7 51.3	10.6	59.8
U 10	330 40.5	37.7	198 44.8	8.5	8 01.9	10.6	59.9
N 11	345 40.4	38.1	213 12.3	8.4	8 12.5	10.6	59.9
D 12	0 40.3	N21 38.5	227 39.7	8.3	S 8 23.1	10.5	60.0
A 13	15 40.2	38.9	242 07.0	8.3	8 33.6	10.5	60.0
Y 14	30 40.1	39.3	256 34.3	8.2	8 44.1	10.5	60.0
15	45 40.1	· · 39.7	271 01.5	8.1	8 54.6	10.4	60.1
16	60 40.0	40.0	285 28.6	8.0	9 05.0	10.3	60.1
17	75 39.9	40.4	299 55.6	8.0	9 15.3	10.3	60.1
18	90 39.8	N21 40.8	314 22.6	7.8	S 9 25.6	10.3	60.2
19	105 39.7	41.2	328 49.4	7.9	9 35.9	10.2	60.2
20	120 39.6	41.6	343 16.3	7.7	9 46.1	10.2	60.2
21	135 39.6	· · 41.9	357 43.0	7.6	9 56.3	10.1	60.3
22	150 39.5	42.3	12 09.6	7.6	10 06.4	10.1	60.3
23	165 39.4	42.7	26 36.2	7.5	10 16.5	10.0	60.3
30 00	180 39.3	N21 43.1	41 02.7	7.4	S10 26.5	9.9	60.3
01	195 39.2	43.5	55 29.1	7.4	10 36.4	9.9	60.4
02	210 39.1	43.8	69 55.5	7.2	10 46.3	9.9	60.4
03	225 39.1	· · 44.2	84 21.7	7.2	10 56.2	9.7	60.4
04	240 39.0	44.6	98 47.9	7.1	11 05.9	9.7	60.5
05	255 38.9	45.0	113 14.0	7.1	11 15.6	9.7	60.5
06	270 38.8	N21 45.3	127 40.1	6.9	S11 25.3	9.6	60.5
07	285 38.7	45.7	142 06.0	6.9	11 34.9	9.5	60.6
08	300 38.6	46.1	156 31.9	6.8	11 44.4	9.4	60.6
M 09	315 38.5	· · 46.4	170 57.7	6.7	11 53.8	9.4	60.6
O 10	330 38.5	46.8	185 23.4	6.6	12 03.2	9.3	60.6
N 11	345 38.4	47.2	199 49.0	6.6	12 12.5	9.3	60.7
D 12	0 38.3	N21 47.5	214 14.6	6.5	S12 21.8	9.1	60.7
A 13	15 38.2	47.9	228 40.1	6.4	12 30.9	9.1	60.7
Y 14	30 38.1	48.3	243 05.5	6.3	12 40.0	9.0	60.7
15	45 38.0	· · 48.7	257 30.8	6.2	12 49.0	8.9	60.8
16	60 37.9	49.0	271 56.0	6.2	12 57.9	8.9	60.8
17	75 37.9	49.4	286 21.2	6.1	13 06.8	8.8	60.8
18	90 37.8	N21 49.8	300 46.3	6.0	S13 15.6	8.6	60.8
19	105 37.7	50.1	315 11.3	6.0	13 24.2	8.6	60.9
20	120 37.6	50.5	329 36.3	5.8	13 32.8	8.6	60.9
21	135 37.5	· · 50.8	344 01.1	5.8	13 41.4	8.4	60.9
22	150 37.4	51.2	358 25.9	5.7	13 49.8	8.3	60.9
23	165 37.3	51.6	12 50.6	5.7	13 58.1	8.3	61.0
	S.D. 15.8	d 0.4	S.D. 16.1		16.3		16.5

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 28	Moonrise 29	Moonrise 30	Moonrise 31
°	h m	h m	h m	h m	h m	h m	h m
N 72	▭	▭	▭	15 04	17 03	19 12	21 38
N 70	▭	▭	▭	14 57	16 48	18 44	20 44
68	▭	▭	▭	14 52	16 36	18 24	20 11
66	////	////	01 26	14 47	16 26	18 07	19 48
64	////	////	02 06	14 43	16 17	17 54	19 29
62	////	00 40	02 33	14 40	16 10	17 43	19 14
60	////	01 35	02 54	14 37	16 04	17 33	19 01
N 58	////	02 07	03 11	14 34	15 59	17 25	18 50
56	00 36	02 29	03 26	14 32	15 54	17 18	18 41
54	01 27	02 48	03 38	14 30	15 50	17 11	18 32
52	01 56	03 03	03 49	14 28	15 46	17 05	18 25
50	02 17	03 16	03 58	14 26	15 42	17 00	18 18
45	02 56	03 43	04 18	14 22	15 35	16 49	18 03
N 40	03 23	04 03	04 35	14 19	15 28	16 40	17 52
35	03 44	04 19	04 48	14 16	15 23	16 32	17 42
30	04 01	04 33	05 00	14 14	15 18	16 25	17 33
20	04 27	04 56	05 20	14 10	15 10	16 13	17 18
N 10	04 48	05 15	05 38	14 07	15 03	16 02	17 04
0	05 06	05 31	05 54	14 03	14 56	15 53	16 52
S 10	05 21	05 47	06 10	14 00	14 50	15 43	16 40
20	05 36	06 03	06 27	13 57	14 43	15 33	16 27
30	05 50	06 20	06 46	13 53	14 35	15 21	16 12
35	05 58	06 29	06 57	13 51	14 31	15 15	16 04
40	06 07	06 40	07 10	13 48	14 26	15 07	15 54
45	06 16	06 52	07 25	13 46	14 20	14 58	15 43
S 50	06 26	07 06	07 44	13 42	14 13	14 48	15 29
52	06 30	07 13	07 52	13 41	14 10	14 43	15 23
54	06 35	07 20	08 02	13 39	14 06	14 38	15 16
56	06 40	07 28	08 13	13 37	14 02	14 32	15 08
58	06 46	07 37	08 26	13 35	13 58	14 25	14 59
S 60	06 53	07 47	08 41	13 33	13 53	14 18	14 49

Lat.	Sunset	Twilight Civil	Twilight Naut.	Moonset 28	Moonset 29	Moonset 30	Moonset 31
°	h m	h m	h m	h m	h m	h m	h m
N 72	▭	▭	▭	01 09	01 03	00 55	00 44
N 70	▭	▭	▭	01 12	01 12	01 12	01 14
68	▭	▭	▭	01 15	01 19	01 26	01 36
66	22 33	////	////	01 17	01 26	01 37	01 53
64	21 51	////	////	01 18	01 31	01 47	02 07
62	21 23	23 23	////	01 20	01 36	01 55	02 19
60	21 02	22 22	////	01 21	01 40	02 02	02 29
N 58	20 44	21 50	////	01 22	01 44	02 08	02 38
56	20 30	21 27	23 26	01 23	01 47	02 14	02 46
54	20 18	21 08	22 30	01 24	01 50	02 19	02 53
52	20 07	20 53	22 01	01 25	01 53	02 23	02 59
50	19 57	20 39	21 39	01 26	01 55	02 27	03 05
45	19 37	20 13	21 00	01 28	02 00	02 36	03 18
N 40	19 20	19 52	20 32	01 29	02 05	02 44	03 28
35	19 07	19 36	20 11	01 30	02 09	02 50	03 37
30	18 55	19 22	19 54	01 32	02 12	02 56	03 44
20	18 34	18 59	19 27	01 33	02 18	03 06	03 58
N 10	18 17	18 40	19 07	01 35	02 23	03 15	04 10
0	18 01	18 23	18 49	01 37	02 28	03 23	04 21
S 10	17 45	18 07	18 33	01 38	02 33	03 31	04 32
20	17 28	17 52	18 19	01 40	02 38	03 40	04 43
30	17 09	17 34	18 04	01 42	02 44	03 50	04 57
35	16 57	17 25	17 56	01 43	02 48	03 55	05 05
40	16 44	17 14	17 48	01 44	02 52	04 02	05 14
45	16 29	17 02	17 39	01 45	02 56	04 10	05 24
S 50	16 11	16 48	17 28	01 47	03 02	04 19	05 37
52	16 02	16 41	17 24	01 48	03 04	04 23	05 43
54	15 52	16 34	17 19	01 48	03 07	04 28	05 49
56	15 41	16 26	17 14	01 49	03 10	04 33	05 57
58	15 28	16 17	17 08	01 50	03 13	04 39	06 05
S 60	15 13	16 07	17 02	01 52	03 17	04 45	06 14

Day	SUN Eqn. of Time 00ʰ	SUN Eqn. of Time 12ʰ	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
	m s	m s	h m	h m	h m	d	
28	02 53	02 49	11 57	20 16	07 50	10	◐
29	02 45	02 41	11 57	21 09	08 42	11	
30	02 37	02 33	11 57	22 07	09 38	12	

1977 MAY 31, JUNE 1, 2 (TUES., WED., THURS.)

G.M.T.			ARIES	VENUS −4.1		MARS +1.3		JUPITER −1.5		SATURN +0.6	
d		h	G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
			° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
31		00	248 22.7	224 48.1	N 7 45.1	224 25.0	N 8 49.2	177 08.7	N21 49.3	113 33.7	N18 06.8
		01	263 25.2	239 48.6	45.7	239 25.7	49.9	192 10.5	49.4	128 36.0	06.7
		02	278 27.6	254 49.1	46.3	254 26.4	50.6	207 12.4	49.5	143 38.2	06.6
		03	293 30.1	269 49.6	·· 46.8	269 27.1	·· 51.3	222 14.2	·· 49.5	158 40.5	·· 06.6
		04	308 32.6	284 50.0	47.4	284 27.8	52.0	237 16.0	49.6	173 42.7	06.5
		05	323 35.0	299 50.5	47.9	299 28.5	52.7	252 17.9	49.7	188 45.0	06.5
		06	338 37.5	314 51.0	N 7 48.5	314 29.2	N 8 53.4	267 19.7	N21 49.8	203 47.3	N18 06.4
		07	353 40.0	329 51.4	49.1	329 29.9	54.1	282 21.6	49.8	218 49.5	06.4
		08	8 42.4	344 51.9	49.6	344 30.6	54.8	297 23.4	49.9	233 51.8	06.3
	T	09	23 44.9	359 52.4	·· 50.2	359 31.3	·· 55.5	312 25.3	·· 50.0	248 54.0	·· 06.2
	U	10	38 47.4	14 52.9	50.8	14 32.0	56.2	327 27.1	50.1	263 56.3	06.2
	E	11	53 49.8	29 53.3	51.3	29 32.7	56.9	342 28.9	50.2	278 58.6	06.1
	S	12	68 52.3	44 53.8	N 7 51.9	44 33.4	N 8 57.6	357 30.8	N21 50.2	294 00.8	N18 06.1
	D	13	83 54.7	59 54.2	52.5	59 34.1	58.3	12 32.6	50.3	309 03.1	06.0
	A	14	98 57.2	74 54.7	53.0	74 34.9	59.0	27 34.5	50.4	324 05.3	06.0
	Y	15	113 59.7	89 55.2	·· 53.6	89 35.6	·· 8 59.7	42 36.3	·· 50.5	339 07.6	·· 05.9
		16	129 02.1	104 55.6	54.2	104 36.3	9 00.4	57 38.2	50.5	354 09.9	05.8
		17	144 04.6	119 56.1	54.8	119 37.0	01.1	72 40.0	50.6	9 12.1	05.8
		18	159 07.1	134 56.5	N 7 55.3	134 37.7	N 9 01.8	87 41.8	N21 50.7	24 14.4	N18 05.7
		19	174 09.5	149 57.0	55.9	149 38.4	02.4	102 43.7	50.8	39 16.6	05.7
		20	189 12.0	164 57.5	56.5	164 39.1	03.1	117 45.5	50.9	54 18.9	05.6
		21	204 14.5	179 57.9	·· 57.1	179 39.8	·· 03.8	132 47.4	·· 50.9	69 21.2	·· 05.6
		22	219 16.9	194 58.4	57.6	194 40.5	04.5	147 49.2	51.0	84 23.4	05.5
		23	234 19.4	209 58.8	58.2	209 41.2	05.2	162 51.1	51.1	99 25.7	05.4
1		00	249 21.8	224 59.3	N 7 58.8	224 41.9	N 9 05.9	177 52.9	N21 51.2	114 27.9	N18 05.4
		01	264 24.3	239 59.7	59.4	239 42.6	06.6	192 54.7	51.2	129 30.2	05.3
		02	279 26.8	255 00.2	7 59.9	254 43.3	07.3	207 56.6	51.3	144 32.5	05.3
		03	294 29.2	270 00.6	8 00.5	269 44.0	·· 08.0	222 58.4	·· 51.4	159 34.7	·· 05.2
		04	309 31.7	285 01.1	01.1	284 44.7	08.7	238 00.3	51.5	174 37.0	05.2
		05	324 34.2	300 01.5	01.7	299 45.4	09.4	253 02.1	51.5	189 39.2	05.1
		06	339 36.6	315 01.9	N 8 02.2	314 46.1	N 9 10.1	268 04.0	N21 51.6	204 41.5	N18 05.0
	W	07	354 39.1	330 02.4	02.8	329 46.8	10.7	283 05.8	51.7	219 43.7	05.0
	E	08	9 41.6	345 02.8	03.4	344 47.5	11.4	298 07.6	51.8	234 46.0	04.9
	D	09	24 44.0	0 03.3	·· 04.0	359 48.2	·· 12.1	313 09.5	·· 51.9	249 48.3	·· 04.9
	N	10	39 46.5	15 03.7	04.6	14 48.9	12.8	328 11.3	51.9	264 50.5	04.8
	E	11	54 49.0	30 04.2	05.1	29 49.6	13.5	343 13.2	52.0	279 52.8	04.8
	S	12	69 51.4	45 04.6	N 8 05.7	44 50.3	N 9 14.2	358 15.0	N21 52.1	294 55.0	N18 04.7
	D	13	84 53.9	60 05.0	06.3	59 51.0	14.9	13 16.9	52.2	309 57.3	04.6
	A	14	99 56.3	75 05.5	06.9	74 51.7	15.6	28 18.7	52.2	324 59.5	04.6
	Y	15	114 58.8	90 05.9	·· 07.5	89 52.4	·· 16.3	43 20.5	·· 52.3	340 01.8	·· 04.5
		16	130 01.3	105 06.3	08.1	104 53.1	17.0	58 22.4	52.4	355 04.0	04.5
		17	145 03.7	120 06.8	08.6	119 53.8	17.6	73 24.2	52.5	10 06.3	04.4
		18	160 06.2	135 07.2	N 8 09.2	134 54.5	N 9 18.3	88 26.1	N21 52.5	25 08.6	N18 04.3
		19	175 08.7	150 07.6	09.8	149 55.2	19.0	103 27.9	52.6	40 10.8	04.3
		20	190 11.1	165 08.1	10.4	164 55.9	19.7	118 29.8	52.7	55 13.1	04.2
		21	205 13.6	180 08.5	·· 11.0	179 56.6	·· 20.4	133 31.6	·· 52.8	70 15.3	·· 04.2
		22	220 16.1	195 08.9	11.6	194 57.3	21.1	148 33.4	52.9	85 17.6	04.1
		23	235 18.5	210 09.3	12.2	209 58.0	21.8	163 35.3	52.9	100 19.8	04.1
2		00	250 21.0	225 09.8	N 8 12.8	224 58.7	N 9 22.5	178 37.1	N21 53.0	115 22.1	N18 04.0
		01	265 23.5	240 10.2	13.3	239 59.4	23.1	193 39.0	53.1	130 24.3	03.9
		02	280 25.9	255 10.6	13.9	255 00.1	23.8	208 40.8	53.2	145 26.6	03.9
		03	295 28.4	270 11.0	·· 14.5	270 00.8	·· 24.5	223 42.7	·· 53.2	160 28.9	·· 03.8
		04	310 30.8	285 11.4	15.1	285 01.5	25.2	238 44.5	53.3	175 31.1	03.8
		05	325 33.3	300 11.9	15.7	300 02.2	25.9	253 46.3	53.4	190 33.4	03.7
		06	340 35.8	315 12.3	N 8 16.3	315 02.9	N 9 26.6	268 48.2	N21 53.5	205 35.6	N18 03.6
		07	355 38.2	330 12.7	16.9	330 03.6	27.3	283 50.0	53.5	220 37.9	03.6
	T	08	10 40.7	345 13.1	17.5	345 04.3	28.0	298 51.9	53.6	235 40.1	03.5
	H	09	25 43.2	0 13.5	·· 18.1	0 05.0	·· 28.6	313 53.7	·· 53.7	250 42.4	·· 03.5
	U	10	40 45.6	15 13.9	18.7	15 05.7	29.3	328 55.6	53.8	265 44.6	03.4
	R	11	55 48.1	30 14.4	19.3	30 06.4	30.0	343 57.4	53.8	280 46.9	03.3
	S	12	70 50.6	45 14.8	N 8 19.9	45 07.1	N 9 30.7	358 59.2	N21 53.9	295 49.1	N18 03.3
	D	13	85 53.0	60 15.2	20.5	60 07.8	31.4	14 01.1	54.0	310 51.4	03.2
	A	14	100 55.5	75 15.6	21.1	75 08.5	32.1	29 02.9	54.1	325 53.6	03.2
	Y	15	115 57.9	90 16.0	·· 21.7	90 09.2	·· 32.8	44 04.8	·· 54.1	340 55.9	·· 03.1
		16	131 00.4	105 16.4	22.2	105 09.9	33.4	59 06.6	54.2	355 58.2	03.1
		17	146 02.9	120 16.8	22.8	120 10.6	34.1	74 08.5	54.3	11 00.4	03.0
		18	161 05.3	135 17.2	N 8 23.4	135 11.3	N 9 34.8	89 10.3	N21 54.4	26 02.7	N18 02.9
		19	176 07.8	150 17.6	24.0	150 12.0	35.5	104 12.1	54.4	41 04.9	02.9
		20	191 10.3	165 18.0	24.6	165 12.7	36.2	119 14.0	54.5	56 07.2	02.8
		21	206 12.7	180 18.4	·· 25.2	180 13.4	·· 36.9	134 15.8	·· 54.6	71 09.4	·· 02.8
		22	221 15.2	195 18.8	25.8	195 14.1	37.5	149 17.7	54.7	86 11.7	02.7
		23	236 17.7	210 19.2	26.4	210 14.8	38.2	164 19.5	54.8	101 13.9	02.6
Mer. Pass.			h m 7 21.3	v 0.4	d 0.6	v 0.7	d 0.7	v 1.8	d 0.1	v 2.3	d 0.1

STARS

Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 39.4	S40 23.7
Achernar	335 47.4	S57 20.9
Acrux	173 39.3	S62 58.8
Adhara	255 34.2	S28 56.7
Aldebaran	291 20.9	N16 27.7
Alioth	166 44.3	N56 05.1
Alkaid	153 20.0	N49 25.7
Al Na'ir	28 17.7	S47 03.9
Alnilam	276 14.3	S 1 13.1
Alphard	218 22.9	S 8 33.8
Alphecca	126 33.7	N26 47.5
Alpheratz	358 11.7	N28 57.8
Altair	62 34.5	N 8 48.5
Ankaa	353 42.7	S42 25.5
Antares	112 59.2	S26 22.9
Arcturus	146 20.2	N19 18.0
Atria	108 24.8	S68 59.2
Avior	234 29.4	S59 26.6
Bellatrix	279 01.5	N 6 19.6
Betelgeuse	271 31.0	N 7 24.1
Canopus	264 08.7	S52 41.3
Capella	281 15.1	N45 58.5
Deneb	49 49.7	N45 11.9
Denebola	183 01.2	N14 41.9
Diphda	349 23.3	S18 06.6
Dubhe	194 24.9	N61 52.6
Elnath	278 47.3	N28 35.2
Eltanin	90 58.3	N51 29.5
Enif	34 13.7	N 9 46.3
Fomalhaut	15 53.9	S29 44.3
Gacrux	172 30.9	S56 59.5
Gienah	176 20.1	S17 25.2
Hadar	149 25.9	S60 16.1
Hamal	328 31.7	N23 21.2
Kaus Aust.	84 19.4	S34 23.6
Kochab	137 18.0	N74 15.1
Markab	14 05.4	N15 05.0
Menkar	314 43.8	N 4 00.0
Menkent	148 39.3	S36 15.7
Miaplacidus	221 45.7	S69 37.9
Mirfak	309 19.7	N49 46.7
Nunki	76 31.6	S26 19.4
Peacock	54 01.6	S56 48.2
Pollux	244 01.2	N28 04.8
Procyon	245 28.4	N 5 16.9
Rasalhague	96 31.3	N12 34.6
Regulus	208 12.5	N12 04.6
Rigel	281 38.5	S 8 13.8
Rigil Kent.	140 28.2	S60 44.6
Sabik	102 43.3	S15 41.8
Schedar	350 11.7	N56 24.6
Shaula	96 58.4	S37 05.2
Sirius	258 58.0	S16 41.3
Spica	158 59.7	S11 02.7
Suhail	223 12.6	S43 20.8
Vega	80 56.9	N38 45.7
Zuben'ubi	137 35.2	S15 56.9

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	335 37.4	9 00
Mars	335 20.0	9 01
Jupiter	288 31.1	12 07
Saturn	225 06.1	16 20

G.M.T.			SUN G.H.A.	SUN Dec.	MOON G.H.A.	MOON *v*	MOON Dec.	MOON *d*	MOON H.P.
d		h	° ′	° ′	° ′	′	° ′	′	′
31		00	180 37.2	N21 51.9	27 15.3	5.5	S14 06.4	8.1	61.0
		01	195 37.2	52.3	41 39.8	5.5	14 14.5	8.1	61.0
		02	210 37.1	52.6	56 04.3	5.5	14 22.6	8.0	61.0
		03	225 37.0	·· 53.0	70 28.8	5.3	14 30.6	7.8	61.0
		04	240 36.9	53.4	84 53.1	5.3	14 38.4	7.8	61.1
		05	255 36.8	53.7	99 17.4	5.2	14 46.2	7.7	61.1
		06	270 36.7	N21 54.1	113 41.6	5.1	S14 53.9	7.5	61.1
		07	285 36.6	54.4	128 05.7	5.1	15 01.4	7.5	61.1
	TUESDAY	08	300 36.5	54.8	142 29.8	5.0	15 08.9	7.4	61.1
		09	315 36.4	·· 55.1	156 53.8	4.9	15 16.3	7.2	61.2
		10	330 36.3	55.5	171 17.7	4.9	15 23.5	7.2	61.2
		11	345 36.3	55.9	185 41.6	4.8	15 30.7	7.0	61.2
		12	0 36.2	N21 56.2	200 05.4	4.7	S15 37.7	7.0	61.2
		13	15 36.1	56.6	214 29.1	4.7	15 44.7	6.8	61.2
		14	30 36.0	56.9	228 52.8	4.6	15 51.5	6.7	61.2
		15	45 35.9	·· 57.3	243 16.4	4.6	15 58.2	6.6	61.2
		16	60 35.8	57.6	257 40.0	4.4	16 04.8	6.5	61.3
		17	75 35.7	58.0	272 03.4	4.5	16 11.3	6.4	61.3
		18	90 35.6	N21 58.3	286 26.9	4.3	S16 17.7	6.2	61.3
		19	105 35.5	58.7	300 50.2	4.3	16 23.9	6.2	61.3
		20	120 35.4	59.0	315 13.5	4.3	16 30.1	6.0	61.3
		21	135 35.3	·· 59.4	329 36.8	4.2	16 36.1	5.9	61.3
		22	150 35.3	21 59.7	344 00.0	4.1	16 42.0	5.8	61.3
		23	165 35.2	22 00.1	358 23.1	4.1	16 47.8	5.6	61.3
1		00	180 35.1	N22 00.4	12 46.2	4.1	S16 53.4	5.6	61.3
		01	195 35.0	00.7	27 09.3	4.0	16 59.0	5.4	61.4
		02	210 34.9	01.1	41 32.3	3.9	17 04.4	5.3	61.4
		03	225 34.8	·· 01.4	55 55.2	3.9	17 09.7	5.1	61.4
		04	240 34.7	01.8	70 18.1	3.8	17 14.8	5.1	61.4
		05	255 34.6	02.1	84 40.9	3.8	17 19.9	4.9	61.4
		06	270 34.5	N22 02.5	99 03.7	3.8	S17 24.8	4.7	61.4
	WEDNESDAY	07	285 34.4	02.8	113 26.5	3.7	17 29.5	4.7	61.4
		08	300 34.3	03.1	127 49.2	3.7	17 34.2	4.5	61.4
		09	315 34.2	·· 03.5	142 11.9	3.7	17 38.7	4.4	61.4
		10	330 34.1	03.8	156 34.6	3.6	17 43.1	4.2	61.4
		11	345 34.0	04.2	170 57.2	3.5	17 47.3	4.1	61.4
		12	0 33.9	N22 04.5	185 19.7	3.6	S17 51.4	4.0	61.4
		13	15 33.9	04.8	199 42.3	3.5	17 55.4	3.8	61.4
		14	30 33.8	05.2	214 04.8	3.5	17 59.2	3.7	61.4
		15	45 33.7	·· 05.5	228 27.3	3.4	18 02.9	3.6	61.4
		16	60 33.6	05.8	242 49.7	3.4	18 06.5	3.4	61.4
		17	75 33.5	06.2	257 12.1	3.4	18 09.9	3.3	61.4
		18	90 33.4	N22 06.5	271 34.5	3.4	S18 13.2	3.2	61.4
		19	105 33.3	06.8	285 56.9	3.4	18 16.4	3.0	61.4
		20	120 33.2	07.2	300 19.3	3.3	18 19.4	2.9	61.4
		21	135 33.1	·· 07.5	314 41.6	3.3	18 22.3	2.7	61.4
		22	150 33.0	07.8	329 03.9	3.3	18 25.0	2.6	61.4
		23	165 32.9	08.2	343 26.2	3.3	18 27.6	2.4	61.4
2		00	180 32.8	N22 08.5	357 48.5	3.3	S18 30.0	2.4	61.4
		01	195 32.7	08.8	12 10.8	3.3	18 32.4	2.1	61.4
		02	210 32.6	09.1	26 33.1	3.3	18 34.5	2.1	61.4
		03	225 32.5	·· 09.5	40 55.4	3.2	18 36.6	1.8	61.4
		04	240 32.4	09.8	55 17.6	3.3	18 38.4	1.8	61.4
		05	255 32.3	10.1	69 39.9	3.2	18 40.2	1.6	61.4
		06	270 32.2	N22 10.4	84 02.1	3.3	S18 41.8	1.4	61.3
		07	285 32.1	10.8	98 24.4	3.2	18 43.2	1.4	61.3
	THURSDAY	08	300 32.0	11.1	112 46.6	3.3	18 44.6	1.1	61.3
		09	315 31.9	·· 11.4	127 08.9	3.3	18 45.7	1.1	61.3
		10	330 31.8	11.7	141 31.2	3.2	18 46.8	0.8	61.3
		11	345 31.7	12.1	155 53.4	3.3	18 47.6	0.8	61.3
		12	0 31.6	N22 12.4	170 15.7	3.3	S18 48.4	0.6	61.3
		13	15 31.5	12.7	184 38.0	3.3	18 49.0	0.4	61.3
		14	30 31.4	13.0	199 00.3	3.3	18 49.4	0.3	61.3
		15	45 31.3	·· 13.3	213 22.6	3.4	18 49.7	0.2	61.2
		16	60 31.2	13.7	227 45.0	3.3	18 49.9	0.0	61.2
		17	75 31.1	14.0	242 07.3	3.4	18 49.9	0.1	61.2
		18	90 31.0	N22 14.3	256 29.7	3.4	S18 49.8	0.2	61.2
		19	105 30.9	14.6	270 52.1	3.4	18 49.6	0.4	61.2
		20	120 30.8	14.9	285 14.5	3.5	18 49.2	0.6	61.2
		21	135 30.7	·· 15.2	299 37.0	3.5	18 48.6	0.7	61.2
		22	150 30.6	15.6	313 59.5	3.5	18 47.9	0.8	61.1
		23	165 30.5	15.9	328 22.0	3.5	18 47.1	0.9	61.1
			S.D. 15.8	*d* 0.3	S.D. 16.7		16.7		16.7

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 31	Moonrise 1	Moonrise 2	Moonrise 3
°	h m	h m	h m	h m	h m	h m	h m
N 72	□	□	□	21 38	■	■	■
N 70	□	□	□	20 44	22 36	23 51	24 18
68	□	□	□	20 11	21 49	23 00	23 40
66	////	////	01 13	19 48	21 18	22 27	23 13
64	////	////	01 58	19 29	20 55	22 04	22 52
62	////	////	02 27	19 14	20 37	21 45	22 35
60	////	01 26	02 49	19 01	20 22	21 29	22 21
N 58	////	02 00	03 07	18 50	20 09	21 16	22 09
56	////	02 25	03 22	18 41	19 58	21 05	21 59
54	01 19	02 44	03 35	18 32	19 48	20 55	21 49
52	01 50	03 00	03 46	18 25	19 39	20 46	21 41
50	02 13	03 13	03 56	18 18	19 32	20 38	21 34
45	02 53	03 40	04 17	18 03	19 15	20 21	21 18
N 40	03 21	04 01	04 33	17 52	19 02	20 07	21 05
35	03 42	04 18	04 47	17 42	18 50	19 55	20 54
30	04 00	04 32	04 59	17 33	18 40	19 45	20 44
20	04 27	04 56	05 20	17 18	18 23	19 27	20 27
N 10	04 48	05 15	05 38	17 04	18 08	19 12	20 13
0	05 06	05 32	05 54	16 52	17 54	18 57	19 59
S 10	05 22	05 48	06 10	16 40	17 40	18 43	19 45
20	05 37	06 04	06 28	16 27	17 26	18 27	19 31
30	05 52	06 21	06 48	16 12	17 09	18 10	19 14
35	06 00	06 31	06 59	16 04	16 59	18 00	19 04
40	06 08	06 42	07 12	15 54	16 48	17 48	18 53
45	06 18	06 55	07 28	15 43	16 35	17 34	18 40
S 50	06 28	07 09	07 47	15 29	16 19	17 18	18 24
52	06 33	07 16	07 56	15 23	16 11	17 10	18 17
54	06 38	07 23	08 06	15 16	16 03	17 01	18 08
56	06 44	07 32	08 17	15 08	15 54	16 51	17 59
58	06 50	07 41	08 31	14 59	15 44	16 40	17 48
S 60	06 56	07 51	08 46	14 49	15 32	16 27	17 36

Lat.	Sunset	Twilight Civil	Twilight Naut.	Moonset 31	Moonset 1	Moonset 2	Moonset 3
°	h m	h m	h m	h m	h m	h m	h m
N 72	□	□	□	00 44	00 25	■	■
N 70	□	□	□	01 14	01 19	01 38	02 35
68	□	□	□	01 36	01 53	02 26	03 26
66	22 47	////	////	01 53	02 17	02 57	03 58
64	21 59	////	////	02 07	02 36	03 20	04 22
62	21 30	////	////	02 19	02 52	03 38	04 41
60	21 07	22 32	////	02 29	03 05	03 54	04 56
N 58	20 49	21 57	////	02 38	03 17	04 07	05 09
56	20 34	21 32	////	02 46	03 27	04 18	05 21
54	20 21	21 13	22 39	02 53	03 35	04 28	05 31
52	20 10	20 57	22 07	02 59	03 43	04 37	05 40
50	20 00	20 43	21 44	03 05	03 50	04 44	05 47
45	19 39	20 16	21 03	03 18	04 06	05 01	06 04
N 40	19 23	19 55	20 35	03 28	04 18	05 15	06 18
35	19 08	19 38	20 14	03 37	04 29	05 27	06 30
30	18 56	19 23	19 56	03 44	04 38	05 37	06 40
20	18 36	19 00	19 29	03 58	04 54	05 55	06 57
N 10	18 18	18 41	19 07	04 10	05 08	06 10	07 13
0	18 01	18 24	18 50	04 21	05 21	06 24	07 27
S 10	17 45	18 08	18 34	04 32	05 35	06 38	07 41
20	17 28	17 51	18 19	04 43	05 49	06 54	07 56
30	17 08	17 34	18 03	04 57	06 05	07 11	08 13
35	16 56	17 24	17 55	05 05	06 14	07 21	08 23
40	16 43	17 13	17 47	05 14	06 25	07 33	08 35
45	16 27	17 01	17 37	05 24	06 38	07 47	08 48
S 50	16 08	16 46	17 27	05 37	06 53	08 03	09 04
52	15 59	16 39	17 22	05 43	07 00	08 11	09 12
54	15 49	16 32	17 17	05 49	07 08	08 20	09 21
56	15 38	16 23	17 11	05 57	07 17	08 29	09 30
58	15 24	16 14	17 05	06 05	07 27	08 41	09 41
S 60	15 09	16 04	16 59	06 14	07 39	08 53	09 53

Day	SUN Eqn. of Time 00ʰ	SUN Eqn. of Time 12ʰ	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
	m s	m s	h m	h m	h m	d	
31	02 29	02 25	11 58	23 07	10 36	13	○
1	02 20	02 16	11 58	24 09	11 38	14	
2	02 11	02 07	11 58	00 09	12 41	15	

1977 JUNE 3, 4, 5 (FRI., SAT., SUN.)

G.M.T.	ARIES	VENUS −4.1		MARS +1.3		JUPITER −1.5		SATURN +0.6	
	G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
d h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
3 00	251 20.1	225 19.6	N 8 27.0	225 15.5	N 9 38.9	179 21.4	N21 54.8	116 16.2	N18 02.6
01	266 22.6	240 20.0	27.6	240 16.2	39.6	194 23.2	54.9	131 18.4	02.5
02	281 25.1	255 20.4	28.3	255 16.9	40.3	209 25.0	55.0	146 20.7	02.5
03	296 27.5	270 20.8	·· 28.9	270 17.6	·· 41.0	224 26.9	·· 55.1	161 22.9	·· 02.4
04	311 30.0	285 21.2	29.5	285 18.3	41.6	239 28.7	55.1	176 25.2	02.3
05	326 32.4	300 21.6	30.1	300 19.0	42.3	254 30.6	55.2	191 27.4	02.3
06	341 34.9	315 22.0	N 8 30.7	315 19.7	N 9 43.0	269 32.4	N21 55.3	206 29.7	N18 02.2
07	356 37.4	330 22.4	31.3	330 20.4	43.7	284 34.2	55.4	221 31.9	02.2
08	11 39.8	345 22.8	31.9	345 21.1	44.4	299 36.1	55.4	236 34.2	02.1
F 09	26 42.3	0 23.2	·· 32.5	0 21.8	·· 45.1	314 37.9	·· 55.5	251 36.4	·· 02.0
R 10	41 44.8	15 23.6	33.1	15 22.5	45.7	329 39.8	55.6	266 38.7	02.0
I 11	56 47.2	30 24.0	33.7	30 23.2	46.4	344 41.6	55.7	281 40.9	01.9
D 12	71 49.7	45 24.3	N 8 34.3	45 23.9	N 9 47.1	359 43.5	N21 55.7	296 43.2	N18 01.9
A 13	86 52.2	60 24.7	34.9	60 24.6	47.8	14 45.3	55.8	311 45.4	01.8
Y 14	101 54.6	75 25.1	35.5	75 25.3	48.5	29 47.1	55.9	326 47.7	01.7
15	116 57.1	90 25.5	·· 36.1	90 26.0	·· 49.1	44 49.0	·· 56.0	341 49.9	·· 01.7
16	131 59.6	105 25.9	36.7	105 26.7	49.8	59 50.8	56.0	356 52.2	01.6
17	147 02.0	120 26.3	37.4	120 27.4	50.5	74 52.7	56.1	11 54.4	01.6
18	162 04.5	135 26.6	N 8 38.0	135 28.1	N 9 51.2	89 54.5	N21 56.2	26 56.7	N18 01.5
19	177 06.9	150 27.0	38.6	150 28.8	51.9	104 56.4	56.3	41 58.9	01.4
20	192 09.4	165 27.4	39.2	165 29.5	52.5	119 58.2	56.3	57 01.2	01.4
21	207 11.9	180 27.8	·· 39.8	180 30.2	·· 53.2	135 00.0	·· 56.4	72 03.4	·· 01.3
22	222 14.3	195 28.1	40.4	195 30.9	53.9	150 01.9	56.5	87 05.7	01.3
23	237 16.8	210 28.5	41.0	210 31.6	54.6	165 03.7	56.5	102 07.9	01.2
4 00	252 19.3	225 28.9	N 8 41.6	225 32.3	N 9 55.3	180 05.6	N21 56.6	117 10.2	N18 01.1
01	267 21.7	240 29.3	42.3	240 33.0	55.9	195 07.4	56.7	132 12.4	01.1
02	282 24.2	255 29.6	42.9	255 33.7	56.6	210 09.3	56.8	147 14.7	01.0
03	297 26.7	270 30.0	·· 43.5	270 34.4	·· 57.3	225 11.1	·· 56.8	162 16.9	·· 01.0
04	312 29.1	285 30.4	44.1	285 35.1	58.0	240 12.9	56.9	177 19.2	00.9
05	327 31.6	300 30.8	44.7	300 35.8	58.6	255 14.8	57.0	192 21.4	00.8
06	342 34.0	315 31.1	N 8 45.3	315 36.5	N 9 59.3	270 16.6	N21 57.1	207 23.7	N18 00.8
07	357 36.5	330 31.5	45.9	330 37.2	10 00.0	285 18.5	57.1	222 25.9	00.7
S 08	12 39.0	345 31.9	46.6	345 37.9	00.7	300 20.3	57.2	237 28.2	00.7
A 09	27 41.4	0 32.2	·· 47.2	0 38.6	·· 01.4	315 22.1	·· 57.3	252 30.4	·· 00.6
T 10	42 43.9	15 32.6	47.8	15 39.3	02.0	330 24.0	57.4	267 32.7	00.5
U 11	57 46.4	30 32.9	48.4	30 39.9	02.7	345 25.8	57.4	282 34.9	00.5
R 12	72 48.8	45 33.3	N 8 49.0	45 40.6	N10 03.4	0 27.7	N21 57.5	297 37.2	N18 00.4
D 13	87 51.3	60 33.7	49.7	60 41.3	04.1	15 29.5	57.6	312 39.4	00.4
A 14	102 53.8	75 34.0	50.3	75 42.0	04.7	30 31.4	57.7	327 41.7	00.3
Y 15	117 56.2	90 34.4	·· 50.9	90 42.7	·· 05.4	45 33.2	·· 57.7	342 43.9	·· 00.2
16	132 58.7	105 34.7	51.5	105 43.4	06.1	60 35.0	57.8	357 46.1	00.2
17	148 01.2	120 35.1	52.1	120 44.1	06.8	75 36.9	57.9	12 48.4	00.1
18	163 03.6	135 35.5	N 8 52.8	135 44.8	N10 07.4	90 38.7	N21 58.0	27 50.6	N18 00.0
19	178 06.1	150 35.8	53.4	150 45.5	08.1	105 40.6	58.0	42 52.9	18 00.0
20	193 08.5	165 36.2	54.0	165 46.2	08.8	120 42.4	58.1	57 55.1	17 59.9
21	208 11.0	180 36.5	·· 54.6	180 46.9	·· 09.5	135 44.3	·· 58.2	72 57.4	·· 59.9
22	223 13.5	195 36.9	55.3	195 47.6	10.1	150 46.1	58.2	87 59.6	59.8
23	238 15.9	210 37.2	55.9	210 48.3	10.8	165 47.9	58.3	103 01.9	59.7
5 00	253 18.4	225 37.6	N 8 56.5	225 49.0	N10 11.5	180 49.8	N21 58.4	118 04.1	N17 59.7
01	268 20.9	240 37.9	57.1	240 49.7	12.2	195 51.6	58.5	133 06.4	59.6
02	283 23.3	255 38.3	57.8	255 50.4	12.8	210 53.5	58.5	148 08.6	59.6
03	298 25.8	270 38.6	·· 58.4	270 51.1	·· 13.5	225 55.3	·· 58.6	163 10.9	·· 59.5
04	313 28.3	285 39.0	59.0	285 51.8	14.2	240 57.1	58.7	178 13.1	59.4
05	328 30.7	300 39.3	8 59.6	300 52.5	14.9	255 59.0	58.8	193 15.3	59.4
06	343 33.2	315 39.6	N 9 00.3	315 53.2	N10 15.5	271 00.8	N21 58.8	208 17.6	N17 59.3
07	358 35.7	330 40.0	00.9	330 53.9	16.2	286 02.7	58.9	223 19.8	59.2
08	13 38.1	345 40.3	01.5	345 54.6	16.9	301 04.5	59.0	238 22.1	59.2
S 09	28 40.6	0 40.7	·· 02.1	0 55.3	·· 17.5	316 06.4	·· 59.1	253 24.3	·· 59.1
U 10	43 43.0	15 41.0	02.8	15 56.0	18.2	331 08.2	59.1	268 26.6	59.1
N 11	58 45.5	30 41.4	03.4	30 56.7	18.9	346 10.0	59.2	283 28.8	59.0
D 12	73 48.0	45 41.7	N 9 04.0	45 57.4	N10 19.6	1 11.9	N21 59.3	298 31.1	N17 58.9
A 13	88 50.4	60 42.0	04.7	60 58.1	20.2	16 13.7	59.3	313 33.3	58.9
Y 14	103 52.9	75 42.4	05.3	75 58.8	20.9	31 15.6	59.4	328 35.6	58.8
15	118 55.4	90 42.7	·· 05.9	90 59.5	·· 21.6	46 17.4	·· 59.5	343 37.8	·· 58.8
16	133 57.8	105 43.0	06.6	106 00.2	22.2	61 19.2	59.6	358 40.0	58.7
17	149 00.3	120 43.4	07.2	121 00.9	22.9	76 21.1	59.6	13 42.3	58.6
18	164 02.8	135 43.7	N 9 07.8	136 01.6	N10 23.6	91 22.9	N21 59.7	28 44.5	N17 58.6
19	179 05.2	150 44.0	08.5	151 02.3	24.3	106 24.8	59.8	43 46.8	58.5
20	194 07.7	165 44.4	09.1	166 03.0	24.9	121 26.6	59.9	58 49.0	58.4
21	209 10.1	180 44.7	·· 09.7	181 03.7	·· 25.6	136 28.5	21 59.9	73 51.3	·· 58.4
22	224 12.6	195 45.0	10.4	196 04.4	26.3	151 30.3	22 00.0	88 53.5	58.3
23	239 15.1	210 45.3	11.0	211 05.1	26.9	166 32.1	00.1	103 55.7	58.3
Mer. Pass.	h m 7 09.5	v 0.4	d 0.6	v 0.7	d 0.7	v 1.8	d 0.1	v 2.2	d 0.1

STARS

Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 39.3	S40 23.7
Achernar	335 47.4	S57 20.9
Acrux	173 39.3	S62 58.8
Adhara	255 34.2	S28 56.7
Aldebaran	291 20.9	N16 27.7
Alioth	166 44.3	N56 05.1
Alkaid	153 20.0	N49 25.7
Al Na'ir	28 17.7	S47 03.9
Alnilam	276 14.2	S 1 13.1
Alphard	218 22.9	S 8 33.8
Alphecca	126 33.7	N26 47.5
Alpheratz	358 11.7	N28 57.8
Altair	62 34.4	N 8 48.5
Ankaa	353 42.7	S42 25.5
Antares	112 59.2	S26 22.9
Arcturus	146 20.2	N19 18.1
Atria	108 24.8	S68 59.2
Avior	234 29.5	S59 26.6
Bellatrix	279 01.5	N 6 19.6
Betelgeuse	271 31.0	N 7 24.1
Canopus	264 08.7	S52 41.2
Capella	281 15.0	N45 58.4
Deneb	49 49.7	N45 11.9
Denebola	183 01.3	N14 41.9
Diphda	349 23.3	S18 06.6
Dubhe	194 25.0	N61 52.6
Elnath	278 47.3	N28 35.2
Eltanin	90 58.2	N51 29.5
Enif	34 13.6	N 9 46.3
Fomalhaut	15 53.9	S29 44.3
Gacrux	172 30.9	S56 59.5
Gienah	176 20.1	S17 25.2
Hadar	149 25.9	S60 16.1
Hamal	328 31.7	N23 21.2
Kaus Aust.	84 19.4	S34 23.6
Kochab	137 18.0	N74 15.1
Markab	14 05.4	N15 05.0
Menkar	314 43.7	N 4 00.0
Menkent	148 39.3	S36 15.7
Miaplacidus	221 45.7	S69 37.9
Mirfak	309 19.7	N49 46.7
Nunki	76 31.6	S26 19.4
Peacock	54 01.6	S56 48.2
Pollux	244 01.2	N28 04.8
Procyon	245 28.4	N 5 16.9
Rasalhague	96 31.3	N12 34.6
Regulus	208 12.5	N12 04.6
Rigel	281 38.5	S 8 13.8
Rigil Kent.	140 28.2	S60 44.6
Sabik	102 43.3	S15 41.8
Schedar	350 11.7	N56 24.6
Shaula	96 58.3	S37 05.2
Sirius	258 58.0	S16 41.3
Spica	158 59.7	S11 02.7
Suhail	223 12.6	S43 20.8
Vega	80 56.9	N38 45.8
Zuben'ubi	137 35.2	S15 56.9

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	333 09.6	8 58
Mars	333 13.0	8 57
Jupiter	287 46.3	11 58
Saturn	224 50.9	16 09

G.M.T.		SUN		MOON				
		G.H.A.	Dec.	G.H.A.	v	Dec.	d	H.P.
d	h	° ′	° ′	° ′	′	° ′	′	′
3	00	180 30.4	N22 16.2	342 44.5	3.6	S18 46.2	1.2	61.1
	01	195 30.3	16.5	357 07.1	3.6	18 45.0	1.2	61.1
	02	210 30.2	16.8	11 29.7	3.7	18 43.8	1.4	61.1
	03	225 30.1	·· 17.1	25 52.4	3.7	18 42.4	1.5	61.0
	04	240 30.0	17.4	40 15.1	3.7	18 40.9	1.7	61.0
	05	255 29.9	17.7	54 37.8	3.8	18 39.2	1.8	61.0
	06	270 29.8	N22 18.1	69 00.6	3.8	S18 37.4	1.9	61.0
	07	285 29.7	18.4	83 23.4	3.9	18 35.5	2.1	61.0
	08	300 29.6	18.7	97 46.3	3.9	18 33.4	2.2	60.9
F	09	315 29.5	·· 19.0	112 09.2	3.9	18 31.2	2.3	60.9
R	10	330 29.4	19.3	126 32.1	4.1	18 28.9	2.5	60.9
I	11	345 29.3	19.6	140 55.2	4.0	18 26.4	2.6	60.9
D	12	0 29.2	N22 19.9	155 18.2	4.1	S18 23.8	2.7	60.8
A	13	15 29.1	20.2	169 41.3	4.2	18 21.1	2.9	60.8
Y	14	30 29.0	20.5	184 04.5	4.2	18 18.2	3.0	60.8
	15	45 28.9	·· 20.8	198 27.7	4.3	18 15.2	3.1	60.8
	16	60 28.8	21.1	212 51.0	4.4	18 12.1	3.3	60.7
	17	75 28.7	21.4	227 14.4	4.4	18 08.8	3.4	60.7
	18	90 28.6	N22 21.7	241 37.8	4.5	S18 05.4	3.5	60.7
	19	105 28.5	22.0	256 01.3	4.5	18 01.9	3.7	60.7
	20	120 28.4	22.3	270 24.8	4.6	17 58.2	3.7	60.6
	21	135 28.3	·· 22.6	284 48.4	4.7	17 54.5	3.9	60.6
	22	150 28.2	22.9	299 12.1	4.7	17 50.6	4.0	60.6
	23	165 28.1	23.2	313 35.8	4.8	17 46.6	4.2	60.5
4	00	180 28.0	N22 23.5	327 59.6	4.9	S17 42.4	4.2	60.5
	01	195 27.9	23.8	342 23.5	4.9	17 38.2	4.4	60.5
	02	210 27.8	24.1	356 47.4	5.1	17 33.8	4.5	60.5
	03	225 27.7	·· 24.4	11 11.5	5.1	17 29.3	4.6	60.4
	04	240 27.6	24.7	25 35.6	5.1	17 24.7	4.8	60.4
	05	255 27.5	25.0	39 59.7	5.3	17 19.9	4.8	60.4
	06	270 27.4	N22 25.3	54 24.0	5.3	S17 15.1	5.0	60.3
	07	285 27.3	25.6	68 48.3	5.4	17 10.1	5.0	60.3
S	08	300 27.1	25.9	83 12.7	5.4	17 05.1	5.2	60.3
A	09	315 27.0	·· 26.1	97 37.1	5.6	16 59.9	5.3	60.2
T	10	330 26.9	26.4	112 01.7	5.6	16 54.6	5.4	60.2
U	11	345 26.8	26.7	126 26.3	5.7	16 49.2	5.6	60.2
R	12	0 26.7	N22 27.0	140 51.0	5.8	S16 43.6	5.6	60.1
D	13	15 26.6	27.3	155 15.8	5.9	16 38.0	5.7	60.1
A	14	30 26.5	27.6	169 40.7	6.0	16 32.3	5.8	60.1
Y	15	45 26.4	·· 27.9	184 05.7	6.0	16 26.5	6.0	60.0
	16	60 26.3	28.2	198 30.7	6.1	16 20.5	6.0	60.0
	17	75 26.2	28.4	212 55.8	6.2	16 14.5	6.2	60.0
	18	90 26.1	N22 28.7	227 21.0	6.3	S16 08.3	6.2	59.9
	19	105 26.0	29.0	241 46.3	6.4	16 02.1	6.3	59.9
	20	120 25.9	29.3	256 11.7	6.5	15 55.8	6.5	59.9
	21	135 25.8	·· 29.6	270 37.2	6.5	15 49.3	6.5	59.8
	22	150 25.7	29.9	285 02.7	6.7	15 42.8	6.6	59.8
	23	165 25.5	30.1	299 28.4	6.7	15 36.2	6.8	59.7
5	00	180 25.4	N22 30.4	313 54.1	6.8	S15 29.4	6.8	59.7
	01	195 25.3	30.7	328 19.9	6.9	15 22.6	6.9	59.7
	02	210 25.2	31.0	342 45.8	7.0	15 15.7	7.0	59.6
	03	225 25.1	·· 31.3	357 11.8	7.1	15 08.7	7.0	59.6
	04	240 25.0	31.5	11 37.9	7.2	15 01.7	7.2	59.6
	05	255 24.9	31.8	26 04.1	7.2	14 54.5	7.3	59.5
	06	270 24.8	N22 32.1	40 30.3	7.4	S14 47.2	7.3	59.5
	07	285 24.7	32.4	54 56.7	7.4	14 39.9	7.4	59.5
	08	300 24.6	32.6	69 23.1	7.5	14 32.5	7.5	59.4
S	09	315 24.5	·· 32.9	83 49.6	7.6	14 25.0	7.6	59.4
U	10	330 24.4	33.2	98 16.2	7.7	14 17.4	7.6	59.3
N	11	345 24.2	33.5	112 42.9	7.8	14 09.8	7.8	59.3
D	12	0 24.1	N22 33.7	127 09.7	7.9	S14 02.0	7.8	59.3
A	13	15 24.0	34.0	141 36.6	8.0	13 54.2	7.9	59.2
Y	14	30 23.9	34.3	156 03.6	8.0	13 46.3	7.9	59.2
	15	45 23.8	·· 34.5	170 30.6	8.2	13 38.4	8.0	59.1
	16	60 23.7	34.8	184 57.8	8.2	13 30.4	8.2	59.1
	17	75 23.6	35.1	199 25.0	8.3	13 22.2	8.1	59.1
	18	90 23.5	N22 35.4	213 52.3	8.4	S13 14.1	8.3	59.0
	19	105 23.4	35.6	228 19.7	8.5	13 05.8	8.3	59.0
	20	120 23.3	35.9	242 47.2	8.6	12 57.5	8.3	58.9
	21	135 23.1	·· 36.2	257 14.8	8.7	12 49.2	8.5	58.9
	22	150 23.0	36.4	271 42.5	8.8	12 40.7	8.5	58.9
	23	165 22.9	36.7	286 10.3	8.8	12 32.2	8.5	58.8
		S.D. 15.8	d 0.3	S.D. 16.6		16.4		16.1

Lat.	Twilight		Sunrise	Moonrise			
	Naut.	Civil		3	4	5	6
°	h m	h m	h m	h m	h m	h m	h m
N 72	▭	▭	▭	■	01 33	01 02	00 50
N 70	▭	▭	▭	24 18	00 18	00 26	00 28
68	▭	▭	▭	23 40	24 00	00 00	00 11
66	////	////	01 00	23 13	23 40	23 57	24 09
64	////	////	01 51	22 52	23 24	23 46	24 02
62	////	////	02 22	22 35	23 11	23 36	23 55
60	////	01 18	02 45	22 21	22 59	23 28	23 50
N 58	////	01 55	03 04	22 09	22 49	23 20	23 45
56	////	02 20	03 19	21 59	22 41	23 14	23 40
54	01 11	02 40	03 32	21 49	22 33	23 08	23 36
52	01 45	02 57	03 44	21 41	22 26	23 03	23 33
50	02 09	03 11	03 54	21 34	22 20	22 58	23 30
45	02 50	03 39	04 15	21 18	22 06	22 47	23 22
N 40	03 19	04 00	04 32	21 05	21 55	22 39	23 16
35	03 41	04 17	04 46	20 54	21 46	22 31	23 11
30	03 59	04 32	04 59	20 44	21 37	22 24	23 07
20	04 26	04 55	05 20	20 27	21 23	22 13	22 59
N 10	04 48	05 15	05 38	20 13	21 10	22 03	22 52
0	05 06	05 32	05 55	19 59	20 58	21 54	22 45
S 10	05 22	05 49	06 11	19 45	20 46	21 44	22 39
20	05 38	06 05	06 29	19 31	20 33	21 34	22 32
30	05 53	06 23	06 49	19 14	20 19	21 22	22 24
35	06 01	06 33	07 01	19 04	20 10	21 16	22 19
40	06 10	06 44	07 14	18 53	20 01	21 08	22 14
45	06 20	06 57	07 30	18 40	19 49	20 59	22 08
S 50	06 31	07 12	07 50	18 24	19 36	20 48	22 00
52	06 36	07 19	07 59	18 17	19 29	20 43	21 57
54	06 41	07 26	08 09	18 08	19 22	20 38	21 53
56	06 47	07 35	08 21	17 59	19 14	20 32	21 49
58	06 53	07 44	08 35	17 48	19 05	20 25	21 44
S 60	07 00	07 55	08 51	17 36	18 55	20 17	21 39

Lat.	Sunset	Twilight		Moonset			
		Civil	Naut.	3	4	5	6
°	h m	h m	h m	h m	h m	h m	h m
N 72	▭	▭	▭	■	03 02	05 35	07 40
N 70	▭	▭	▭	02 35	04 17	06 10	08 00
68	▭	▭	▭	03 26	04 54	06 35	08 16
66	23 01	////	////	03 58	05 21	06 54	08 29
64	22 07	////	////	04 22	05 41	07 09	08 39
62	21 36	////	////	04 41	05 58	07 22	08 48
60	21 12	22 41	////	04 56	06 11	07 33	08 56
N 58	20 54	22 03	////	05 09	06 23	07 42	09 03
56	20 38	21 37	////	05 21	06 33	07 50	09 08
54	20 25	21 17	22 48	05 31	06 42	07 58	09 14
52	20 13	21 00	22 13	05 40	06 50	08 04	09 18
50	20 03	20 46	21 48	05 47	06 57	08 10	09 23
45	19 42	20 18	21 07	06 04	07 12	08 22	09 32
N 40	19 25	19 57	20 38	06 18	07 25	08 33	09 40
35	19 10	19 40	20 16	06 30	07 36	08 42	09 46
30	18 58	19 25	19 58	06 40	07 45	08 49	09 52
20	18 37	19 01	19 30	06 57	08 01	09 03	10 02
N 10	18 19	18 42	19 08	07 13	08 15	09 14	10 11
0	18 02	18 24	18 50	07 27	08 28	09 25	10 19
S 10	17 45	18 08	18 34	07 41	08 40	09 36	10 27
20	17 27	17 51	18 19	07 56	08 54	09 47	10 35
30	17 07	17 33	18 03	08 13	09 10	10 00	10 45
35	16 55	17 23	17 55	08 23	09 19	10 07	10 50
40	16 42	17 12	17 46	08 35	09 29	10 16	10 57
45	16 26	16 59	17 36	08 48	09 41	10 26	11 04
S 50	16 07	16 44	17 25	09 04	09 56	10 38	11 12
52	15 57	16 37	17 20	09 12	10 02	10 43	11 16
54	15 47	16 30	17 15	09 21	10 10	10 49	11 21
56	15 35	16 21	17 10	09 30	10 18	10 56	11 26
58	15 21	16 12	17 03	09 41	10 28	11 03	11 31
S 60	15 05	16 01	16 56	09 53	10 38	11 12	11 37

Day	SUN			MOON			
	Eqn. of Time		Mer. Pass.	Mer. Pass.		Age	Phase
	00ʰ	12ʰ		Upper	Lower		
	m s	m s	h m	h m	h m	d	
3	02 02	01 57	11 58	01 12	13 43	16	
4	01 52	01 47	11 58	02 13	14 43	17	◑
5	01 42	01 37	11 58	03 12	15 39	18	

	G.M.T.	ARIES	VENUS −4.0		MARS +1.3		JUPITER −1.5		SATURN +0.6	
		G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
	d h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
	6 00	254 17.5	225 45.7	N 9 11.6	226 05.8	N10 27.6	181 34.0	N22 00.1	118 58.0	N17 58.2
	01	269 20.0	240 46.0	12.3	241 06.5	28.3	196 35.8	00.2	134 00.2	58.1
	02	284 22.5	255 46.3	12.9	256 07.2	28.9	211 37.7	00.3	149 02.5	58.1
	03	299 24.9	270 46.6	·· 13.5	271 07.9	·· 29.6	226 39.5	·· 00.4	164 04.7	·· 58.0
	04	314 27.4	285 47.0	14.2	286 08.5	30.3	241 41.3	00.4	179 07.0	57.9
	05	329 29.9	300 47.3	14.8	301 09.2	31.0	256 43.2	00.5	194 09.2	57.9
	06	344 32.3	315 47.6	N 9 15.4	316 09.9	N10 31.6	271 45.0	N22 00.6	209 11.4	N17 57.8
	07	359 34.8	330 47.9	16.1	331 10.6	32.3	286 46.9	00.6	224 13.7	57.8
	08	14 37.3	345 48.2	16.7	346 11.3	33.0	301 48.7	00.7	239 15.9	57.7
M	09	29 39.7	0 48.6	·· 17.4	1 12.0	·· 33.6	316 50.6	·· 00.8	254 18.2	·· 57.6
O	10	44 42.2	15 48.9	18.0	16 12.7	34.3	331 52.4	00.9	269 20.4	57.6
N	11	59 44.6	30 49.2	18.6	31 13.4	35.0	346 54.2	00.9	284 22.7	57.5
D	12	74 47.1	45 49.5	N 9 19.3	46 14.1	N10 35.6	1 56.1	N22 01.0	299 24.9	N17 57.4
A	13	89 49.6	60 49.8	19.9	61 14.8	36.3	16 57.9	01.1	314 27.1	57.4
Y	14	104 52.0	75 50.1	20.6	76 15.5	37.0	31 59.8	01.2	329 29.4	57.3
	15	119 54.5	90 50.4	·· 21.2	91 16.2	·· 37.6	47 01.6	·· 01.2	344 31.6	·· 57.3
	16	134 57.0	105 50.8	21.8	106 16.9	38.3	62 03.5	01.3	359 33.9	57.2
	17	149 59.4	120 51.1	22.5	121 17.6	39.0	77 05.3	01.4	14 36.1	57.1
	18	165 01.9	135 51.4	N 9 23.1	136 18.3	N10 39.6	92 07.1	N22 01.4	29 38.3	N17 57.1
	19	180 04.4	150 51.7	23.8	151 19.0	40.3	107 09.0	01.5	44 40.6	57.0
	20	195 06.8	165 52.0	24.4	166 19.7	41.0	122 10.8	01.6	59 42.8	56.9
	21	210 09.3	180 52.3	·· 25.0	181 20.4	·· 41.6	137 12.7	·· 01.7	74 45.1	·· 56.9
	22	225 11.8	195 52.6	25.7	196 21.1	42.3	152 14.5	01.7	89 47.3	56.8
	23	240 14.2	210 52.9	26.3	211 21.8	42.9	167 16.3	01.8	104 49.5	56.8
	7 00	255 16.7	225 53.2	N 9 27.0	226 22.5	N10 43.6	182 18.2	N22 01.9	119 51.8	N17 56.7
	01	270 19.1	240 53.5	27.6	241 23.2	44.3	197 20.0	01.9	134 54.0	56.6
	02	285 21.6	255 53.8	28.3	256 23.9	44.9	212 21.9	02.0	149 56.3	56.6
	03	300 24.1	270 54.1	·· 28.9	271 24.6	·· 45.6	227 23.7	·· 02.1	164 58.5	·· 56.5
	04	315 26.5	285 54.4	29.6	286 25.3	46.3	242 25.6	02.2	180 00.7	56.4
	05	330 29.0	300 54.7	30.2	301 26.0	46.9	257 27.4	02.2	195 03.0	56.4
	06	345 31.5	315 55.0	N 9 30.9	316 26.7	N10 47.6	272 29.2	N22 02.3	210 05.2	N17 56.3
	07	0 33.9	330 55.3	31.5	331 27.3	48.3	287 31.1	02.4	225 07.5	56.3
	08	15 36.4	345 55.6	32.1	346 28.0	48.9	302 32.9	02.4	240 09.7	56.2
T	09	30 38.9	0 55.9	·· 32.8	1 28.7	·· 49.6	317 34.8	·· 02.5	255 11.9	·· 56.1
U	10	45 41.3	15 56.2	33.4	16 29.4	50.2	332 36.6	02.6	270 14.2	56.1
E	11	60 43.8	30 56.5	34.1	31 30.1	50.9	347 38.4	02.6	285 16.4	56.0
S	12	75 46.2	45 56.8	N 9 34.7	46 30.8	N10 51.6	2 40.3	N22 02.7	300 18.7	N17 55.9
D	13	90 48.7	60 57.0	35.4	61 31.5	52.2	17 42.1	02.8	315 20.9	55.9
A	14	105 51.2	75 57.3	36.0	76 32.2	52.9	32 44.0	02.9	330 23.1	55.8
Y	15	120 53.6	90 57.6	·· 36.7	91 32.9	·· 53.6	47 45.8	·· 02.9	345 25.4	·· 55.7
	16	135 56.1	105 57.9	37.3	106 33.6	54.2	62 47.7	03.0	0 27.6	55.7
	17	150 58.6	120 58.2	38.0	121 34.3	54.9	77 49.5	03.1	15 29.8	55.6
	18	166 01.0	135 58.5	N 9 38.6	136 35.0	N10 55.5	92 51.3	N22 03.1	30 32.1	N17 55.6
	19	181 03.5	150 58.8	39.3	151 35.7	56.2	107 53.2	03.2	45 34.3	55.5
	20	196 06.0	165 59.1	39.9	166 36.4	56.9	122 55.0	03.3	60 36.6	55.4
	21	211 08.4	180 59.3	·· 40.6	181 37.1	·· 57.5	137 56.9	·· 03.4	75 38.8	·· 55.4
	22	226 10.9	195 59.6	41.2	196 37.8	58.2	152 58.7	03.4	90 41.0	55.3
	23	241 13.4	210 59.9	41.9	211 38.5	58.8	168 00.5	03.5	105 43.3	55.2
	8 00	256 15.8	226 00.2	N 9 42.6	226 39.2	N10 59.5	183 02.4	N22 03.6	120 45.5	N17 55.2
	01	271 18.3	241 00.5	43.2	241 39.9	11 00.2	198 04.2	03.6	135 47.7	55.1
	02	286 20.7	256 00.7	43.9	256 40.6	00.8	213 06.1	03.7	150 50.0	55.0
	03	301 23.2	271 01.0	·· 44.5	271 41.3	·· 01.5	228 07.9	·· 03.8	165 52.2	·· 55.0
	04	316 25.7	286 01.3	45.2	286 41.9	02.1	243 09.8	03.8	180 54.5	54.9
	05	331 28.1	301 01.6	45.8	301 42.6	02.8	258 11.6	03.9	195 56.7	54.8
	06	346 30.6	316 01.8	N 9 46.5	316 43.3	N11 03.5	273 13.4	N22 04.0	210 58.9	N17 54.8
W	07	1 33.1	331 02.1	47.1	331 44.0	04.1	288 15.3	04.1	226 01.2	54.7
E	08	16 35.5	346 02.4	47.8	346 44.7	04.8	303 17.1	04.1	241 03.4	54.7
D	09	31 38.0	1 02.7	·· 48.4	1 45.4	·· 05.4	318 19.0	·· 04.2	256 05.6	·· 54.6
N	10	46 40.5	16 02.9	49.1	16 46.1	06.1	333 20.8	04.3	271 07.9	54.5
E	11	61 42.9	31 03.2	49.8	31 46.8	06.7	348 22.7	04.3	286 10.1	54.5
S	12	76 45.4	46 03.5	N 9 50.4	46 47.5	N11 07.4	3 24.5	N22 04.4	301 12.3	N17 54.4
D	13	91 47.9	61 03.7	51.1	61 48.2	08.1	18 26.3	04.5	316 14.6	54.3
A	14	106 50.3	76 04.0	51.7	76 48.9	08.7	33 28.2	04.5	331 16.8	54.3
Y	15	121 52.8	91 04.3	·· 52.4	91 49.6	·· 09.4	48 30.0	·· 04.6	346 19.1	·· 54.2
	16	136 55.2	106 04.5	53.0	106 50.3	10.0	63 31.9	04.7	1 21.3	54.1
	17	151 57.7	121 04.8	53.7	121 51.0	10.7	78 33.7	04.8	16 23.5	54.1
	18	167 00.2	136 05.1	N 9 54.4	136 51.7	N11 11.3	93 35.5	N22 04.8	31 25.8	N17 54.0
	19	182 02.6	151 05.3	55.0	151 52.4	12.0	108 37.4	04.9	46 28.0	53.9
	20	197 05.1	166 05.6	55.7	166 53.1	12.7	123 39.2	05.0	61 30.2	53.9
	21	212 07.6	181 05.8	·· 56.3	181 53.8	·· 13.3	138 41.1	·· 05.0	76 32.5	·· 53.8
	22	227 10.0	196 06.1	57.0	196 54.4	14.0	153 42.9	05.1	91 34.7	53.8
	23	242 12.5	211 06.4	57.7	211 55.1	14.6	168 44.8	05.2	106 36.9	53.7
	Mer. Pass.	h m 6 57.7	v 0.3	d 0.6	v 0.7	d 0.7	v 1.8	d 0.1	v 2.2	d 0.1

STARS

Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 39.3	S40 23.7
Achernar	335 47.4	S57 20.9
Acrux	173 39.3	S62 58.8
Adhara	255 34.2	S28 56.7
Aldebaran	291 20.9	N16 27.7
Alioth	166 44.3	N56 05.2
Alkaid	153 20.0	N49 25.7
Al Na'ir	28 17.6	S47 03.9
Alnilam	276 14.2	S 1 13.1
Alphard	218 22.9	S 8 33.8
Alphecca	126 33.7	N26 47.5
Alpheratz	358 11.7	N28 57.8
Altair	62 34.4	N 8 48.6
Ankaa	353 42.6	S42 25.5
Antares	112 59.2	S26 22.9
Arcturus	146 20.2	N19 18.1
Atria	108 24.8	S68 59.2
Avior	234 29.5	S59 26.6
Bellatrix	279 01.5	N 6 19.6
Betelgeuse	271 31.0	N 7 24.1
Canopus	264 08.7	S52 41.2
Capella	281 15.0	N45 58.4
Deneb	49 49.6	N45 11.9
Denebola	183 01.3	N14 41.9
Diphda	349 23.2	S18 06.5
Dubhe	194 25.0	N61 52.6
Elnath	278 47.3	N28 35.2
Eltanin	90 58.2	N51 29.5
Enif	34 13.6	N 9 46.3
Fomalhaut	15 53.9	S29 44.3
Gacrux	172 30.9	S56 59.5
Gienah	176 20.1	S17 25.2
Hadar	149 25.9	S60 16.1
Hamal	328 31.6	N23 21.2
Kaus Aust.	84 19.4	S34 23.6
Kochab	137 18.1	N74 15.1
Markab	14 05.3	N15 05.0
Menkar	314 43.7	N 4 00.0
Menkent	148 39.3	S36 15.7
Miaplacidus	221 45.8	S69 37.9
Mirfak	309 19.7	N49 46.7
Nunki	76 31.6	S26 19.4
Peacock	54 01.5	S56 48.2
Pollux	244 01.2	N28 04.8
Procyon	245 28.4	N 5 16.9
Rasalhague	96 31.3	N12 34.6
Regulus	208 12.5	N12 04.6
Rigel	281 38.5	S 8 13.8
Rigil Kent.	140 28.2	S60 44.6
Sabik	102 43.3	S15 41.8
Schedar	350 11.7	N56 24.6
Shaula	96 58.3	S37 05.2
Sirius	258 58.0	S16 41.3
Spica	158 59.7	S11 02.7
Suhail	223 12.6	S43 20.8
Vega	80 56.9	N38 45.8
Zuben'ubi	137 35.2	S15 56.9

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	330 36.5	8 56
Mars	331 05.8	8 54
Jupiter	287 01.5	11 49
Saturn	224 35.1	15 58

	G.M.T.	SUN G.H.A.	SUN Dec.	MOON G.H.A.	MOON *v*	MOON Dec.	MOON *d*	MOON H.P.
	d h	° ′	° ′	° ′	′	° ′	′	′
	6 00	180 22.8	N22 36.9	300 38.1	9.0	S12 23.7	8.6	58.8
	01	195 22.7	37.2	315 06.1	9.0	12 15.1	8.7	58.7
	02	210 22.6	37.5	329 34.1	9.1	12 06.4	8.8	58.7
	03	225 22.5	·· 37.7	344 02.2	9.2	11 57.6	8.8	58.7
	04	240 22.4	38.0	358 30.4	9.3	11 48.8	8.8	58.6
	05	255 22.2	38.3	12 58.7	9.3	11 40.0	8.9	58.6
	06	270 22.1	N22 38.5	27 27.0	9.5	S11 31.1	9.0	58.5
	07	285 22.0	38.8	41 55.5	9.5	11 22.1	9.0	58.5
	08	300 21.9	39.0	56 24.0	9.6	11 13.1	9.0	58.5
M	09	315 21.8	·· 39.3	70 52.6	9.7	11 04.1	9.1	58.4
O	10	330 21.7	39.6	85 21.3	9.8	10 55.0	9.2	58.4
N	11	345 21.6	39.8	99 50.1	9.9	10 45.8	9.2	58.3
D	12	0 21.5	N22 40.1	114 19.0	10.0	S10 36.6	9.3	58.3
A	13	15 21.3	40.3	128 48.0	10.0	10 27.3	9.3	58.3
Y	14	30 21.2	40.6	143 17.0	10.1	10 18.0	9.3	58.2
	15	45 21.1	·· 40.8	157 46.1	10.2	10 08.7	9.4	58.2
	16	60 21.0	41.1	172 15.3	10.3	9 59.3	9.4	58.1
	17	75 20.9	41.3	186 44.6	10.3	9 49.9	9.5	58.1
	18	90 20.8	N22 41.6	201 13.9	10.4	S 9 40.4	9.5	58.1
	19	105 20.7	41.8	215 43.3	10.5	9 30.9	9.5	58.0
	20	120 20.6	42.1	230 12.8	10.6	9 21.4	9.6	58.0
	21	135 20.4	·· 42.3	244 42.4	10.7	9 11.8	9.6	58.0
	22	150 20.3	42.6	259 12.1	10.7	9 02.2	9.6	57.9
	23	165 20.2	42.8	273 41.8	10.8	8 52.6	9.7	57.9
	7 00	180 20.1	N22 43.1	288 11.6	10.9	S 8 42.9	9.7	57.8
	01	195 20.0	43.3	302 41.5	11.0	8 33.2	9.8	57.8
	02	210 19.9	43.6	317 11.5	11.0	8 23.4	9.7	57.8
	03	225 19.7	·· 43.8	331 41.5	11.1	8 13.7	9.9	57.7
	04	240 19.6	44.1	346 11.6	11.2	8 03.8	9.8	57.7
	05	255 19.5	44.3	0 41.8	11.2	7 54.0	9.8	57.6
	06	270 19.4	N22 44.5	15 12.0	11.3	S 7 44.2	9.9	57.6
	07	285 19.3	44.8	29 42.3	11.4	7 34.3	9.9	57.6
	08	300 19.2	45.0	44 12.7	11.5	7 24.4	10.0	57.5
T	09	315 19.1	·· 45.3	58 43.2	11.5	7 14.4	9.9	57.5
U	10	330 18.9	45.5	73 13.7	11.6	7 04.5	10.0	57.4
E	11	345 18.8	45.8	87 44.3	11.6	6 54.5	10.0	57.4
S	12	0 18.7	N22 46.0	102 14.9	11.8	S 6 44.5	10.0	57.4
D	13	15 18.6	46.2	116 45.7	11.7	6 34.5	10.1	57.3
A	14	30 18.5	46.5	131 16.4	11.9	6 24.4	10.1	57.3
Y	15	45 18.4	·· 46.7	145 47.3	11.9	6 14.3	10.0	57.3
	16	60 18.2	46.9	160 18.2	12.0	6 04.3	10.1	57.2
	17	75 18.1	47.2	174 49.2	12.0	5 54.2	10.1	57.2
	18	90 18.0	N22 47.4	189 20.2	12.1	S 5 44.1	10.2	57.1
	19	105 17.9	47.6	203 51.3	12.1	5 33.9	10.1	57.1
	20	120 17.8	47.9	218 22.4	12.3	5 23.8	10.2	57.1
	21	135 17.7	·· 48.1	232 53.7	12.2	5 13.6	10.1	57.0
	22	150 17.5	48.3	247 24.9	12.4	5 03.5	10.2	57.0
	23	165 17.4	48.6	261 56.3	12.3	4 53.3	10.2	57.0
	8 00	180 17.3	N22 48.8	276 27.6	12.5	S 4 43.1	10.2	56.9
	01	195 17.2	49.0	290 59.1	12.5	4 32.9	10.2	56.9
	02	210 17.1	49.3	305 30.6	12.5	4 22.7	10.2	56.8
	03	225 16.9	·· 49.5	320 02.1	12.6	4 12.5	10.2	56.8
	04	240 16.8	49.7	334 33.7	12.7	4 02.3	10.3	56.8
	05	255 16.7	50.0	349 05.4	12.7	3 52.0	10.2	56.7
	06	270 16.6	N22 50.2	3 37.1	12.7	S 3 41.8	10.2	56.7
	07	285 16.5	50.4	18 08.8	12.9	3 31.6	10.3	56.7
W	08	300 16.4	50.6	32 40.7	12.8	3 21.3	10.2	56.6
E	09	315 16.2	·· 50.9	47 12.5	12.9	3 11.1	10.3	56.6
D	10	330 16.1	51.1	61 44.4	13.0	3 00.8	10.2	56.6
N	11	345 16.0	51.3	76 16.4	13.0	2 50.6	10.3	56.5
E	12	0 15.9	N22 51.5	90 48.4	13.0	S 2 40.3	10.2	56.5
S	13	15 15.8	51.7	105 20.4	13.1	2 30.1	10.3	56.5
D	14	30 15.6	52.0	119 52.5	13.1	2 19.8	10.2	56.4
A	15	45 15.5	·· 52.2	134 24.6	13.2	2 09.6	10.3	56.4
Y	16	60 15.4	52.4	148 56.8	13.2	1 59.3	10.2	56.4
	17	75 15.3	52.6	163 29.0	13.3	1 49.1	10.2	56.3
	18	90 15.2	N22 52.8	178 01.3	13.3	S 1 38.9	10.3	56.3
	19	105 15.0	53.1	192 33.6	13.3	1 28.6	10.2	56.3
	20	120 14.9	53.3	207 05.9	13.4	1 18.4	10.2	56.2
	21	135 14.8	·· 53.5	221 38.3	13.4	1 08.2	10.2	56.2
	22	150 14.7	53.7	236 10.7	13.5	0 58.0	10.3	56.2
	23	165 14.6	53.9	250 43.2	13.5	0 47.7	10.2	56.1
		S.D. 15.8	*d* 0.2	S.D. 15.9		15.6		15.4

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 6	Moonrise 7	Moonrise 8	Moonrise 9
°	h m	h m	h m	h m	h m	h m	h m
N 72	□	□	□	00 50	00 42	00 35	00 28
N 70	□	□	□	00 28	00 29	00 28	00 27
68	□	□	□	00 11	00 18	00 23	00 26
66	////	////	00 45	24 09	00 09	00 18	00 26
64	////	////	01 45	24 02	00 02	00 14	00 25
62	////	////	02 18	23 55	24 11	00 11	00 25
60	////	01 10	02 42	23 50	24 08	00 08	00 24
N 58	////	01 50	03 01	23 45	24 06	00 06	00 24
56	////	02 17	03 17	23 40	24 03	00 03	00 24
54	01 04	02 37	03 30	23 36	24 01	00 01	00 24
52	01 41	02 54	03 42	23 33	23 59	24 23	00 23
50	02 06	03 09	03 52	23 30	23 57	24 23	00 23
45	02 49	03 37	04 14	23 22	23 54	24 23	00 23
N 40	03 18	03 59	04 31	23 16	23 50	24 22	00 22
35	03 40	04 16	04 46	23 11	23 48	24 22	00 22
30	03 58	04 31	04 58	23 07	23 45	24 21	00 21
20	04 26	04 55	05 20	22 59	23 41	24 21	00 21
N 10	04 48	05 15	05 38	22 52	23 37	24 20	00 20
0	05 07	05 33	05 55	22 45	23 34	24 20	00 20
S 10	05 23	05 49	06 12	22 39	23 30	24 20	00 20
20	05 39	06 06	06 30	22 32	23 27	24 19	00 19
30	05 55	06 24	06 50	22 24	23 22	24 19	00 19
35	06 03	06 34	07 02	22 19	23 20	24 18	00 18
40	06 12	06 46	07 16	22 14	23 17	24 18	00 18
45	06 22	06 59	07 32	22 08	23 14	24 18	00 18
S 50	06 33	07 14	07 52	22 00	23 10	24 17	00 17
52	06 38	07 21	08 02	21 57	23 08	24 17	00 17
54	06 43	07 29	08 12	21 53	23 06	24 17	00 17
56	06 49	07 38	08 24	21 49	23 04	24 17	00 17
58	06 56	07 48	08 38	21 44	23 02	24 17	00 17
S 60	07 03	07 59	08 55	21 39	22 59	24 16	00 16

Lat.	Sunset	Twilight Civil	Twilight Naut.	Moonset 6	Moonset 7	Moonset 8	Moonset 9
°	h m	h m	h m	h m	h m	h m	h m
N 72	□	□	□	07 40	09 34	11 19	13 01
N 70	□	□	□	08 00	09 45	11 24	12 58
68	□	□	□	08 16	09 54	11 27	12 57
66	23 17	////	////	08 29	10 01	11 30	12 55
64	22 14	////	////	08 39	10 07	11 32	12 54
62	21 41	////	////	08 48	10 13	11 34	12 53
60	21 17	22 50	////	08 56	10 17	11 36	12 52
N 58	20 57	22 09	////	09 03	10 21	11 38	12 51
56	20 41	21 42	////	09 08	10 25	11 39	12 51
54	20 28	21 21	22 56	09 14	10 28	11 40	12 50
52	20 16	21 04	22 18	09 18	10 31	11 41	12 49
50	20 06	20 49	21 53	09 23	10 34	11 43	12 49
45	19 44	20 21	21 10	09 32	10 40	11 45	12 48
N 40	19 26	19 59	20 40	09 40	10 44	11 47	12 47
35	19 12	19 41	20 18	09 46	10 48	11 48	12 46
30	18 59	19 27	20 00	09 52	10 52	11 50	12 45
20	18 38	19 02	19 31	10 02	10 58	11 52	12 44
N 10	18 19	18 42	19 09	10 11	11 04	11 54	12 43
0	18 02	18 25	18 51	10 19	11 09	11 56	12 42
S 10	17 45	18 08	18 34	10 27	11 14	11 58	12 41
20	17 27	17 51	18 19	10 35	11 19	12 00	12 39
30	17 07	17 33	18 03	10 45	11 25	12 02	12 38
35	16 55	17 23	17 54	10 50	11 29	12 04	12 37
40	16 41	17 12	17 45	10 57	11 32	12 05	12 36
45	16 25	16 59	17 36	11 04	11 37	12 07	12 35
S 50	16 05	16 43	17 24	11 12	11 42	12 09	12 34
52	15 56	16 36	17 19	11 16	11 45	12 10	12 33
54	15 45	16 28	17 14	11 21	11 47	12 11	12 33
56	15 33	16 19	17 08	11 26	11 50	12 12	12 32
58	15 19	16 10	17 02	11 31	11 54	12 13	12 31
S 60	15 02	15 59	16 55	11 37	11 57	12 15	12 31

Day	SUN Eqn. of Time 00ʰ	SUN Eqn. of Time 12ʰ	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
	m s	m s	h m	h m	h m	d	
6	01 31	01 26	11 59	04 06	16 32	19	◑
7	01 21	01 15	11 59	04 57	17 21	20	
8	01 09	01 04	11 59	05 45	18 08	21	

1977 JUNE 9, 10, 11 (THURS., FRI., SAT.)

G.M.T.	ARIES	VENUS −4.0		MARS +1.3		JUPITER −1.5		SATURN +0.6		STARS		
	G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	Name	S.H.A.	Dec.
d h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	° ′
9 00	257 15.0	226 06.6	N 9 58.3	226 55.8	N11 15.3	183 46.6	N22 05.2	121 39.2	N17 53.6	Acamar	315 39.3	S40 23.6
01	272 17.4	241 06.9	59.0	241 56.5	15.9	198 48.4	05.3	136 41.4	53.6	Achernar	335 47.4	S57 20.9
02	287 19.9	256 07.1	9 59.6	256 57.2	16.6	213 50.3	05.4	151 43.6	53.5	Acrux	173 39.4	S62 58.8
03	302 22.3	271 07.4	10 00.3	271 57.9	·· 17.2	228 52.1	·· 05.4	166 45.9	·· 53.4	Adhara	255 34.2	S28 56.7
04	317 24.8	286 07.6	01.0	286 58.6	17.9	243 54.0	05.5	181 48.1	53.4	Aldebaran	291 20.9	N16 27.7
05	332 27.3	301 07.9	01.6	301 59.3	18.5	258 55.8	05.6	196 50.3	53.3			
06	347 29.7	316 08.2	N10 02.3	317 00.0	N11 19.2	273 57.6	N22 05.7	211 52.6	N17 53.2	Alioth	166 44.3	N56 05.2
07	2 32.2	331 08.4	03.0	332 00.7	19.8	288 59.5	05.7	226 54.8	53.2	Alkaid	153 20.0	N49 25.8
T 08	17 34.7	346 08.7	03.6	347 01.4	20.5	304 01.3	05.8	241 57.0	53.1	Al Na'ir	28 17.6	S47 03.9
H 09	32 37.1	1 08.9	·· 04.3	2 02.1	·· 21.2	319 03.2	·· 05.9	256 59.3	·· 53.0	Alnilam	276 14.2	S 1 13.1
U 10	47 39.6	16 09.2	04.9	17 02.8	21.8	334 05.0	05.9	272 01.5	53.0	Alphard	218 22.9	S 8 33.8
R 11	62 42.1	31 09.4	05.6	32 03.5	22.5	349 06.9	06.0	287 03.7	52.9			
S 12	77 44.5	46 09.6	N10 06.3	47 04.2	N11 23.1	4 08.7	N22 06.1	302 06.0	N17 52.8	Alphecca	126 33.7	N26 47.5
D 13	92 47.0	61 09.9	06.9	62 04.8	23.8	19 10.5	06.1	317 08.2	52.8	Alpheratz	358 11.6	N28 57.8
A 14	107 49.5	76 10.1	07.6	77 05.5	24.4	34 12.4	06.2	332 10.4	52.7	Altair	62 34.4	N 8 48.6
Y 15	122 51.9	91 10.4	·· 08.3	92 06.2	·· 25.1	49 14.2	·· 06.3	347 12.7	·· 52.6	Ankaa	353 42.6	S42 25.5
16	137 54.4	106 10.6	08.9	107 06.9	25.7	64 16.1	06.3	2 14.9	52.6	Antares	112 59.2	S26 22.9
17	152 56.8	121 10.9	09.6	122 07.6	26.4	79 17.9	06.4	17 17.1	52.5			
18	167 59.3	136 11.1	N10 10.3	137 08.3	N11 27.0	94 19.7	N22 06.5	32 19.4	N17 52.4	Arcturus	146 20.3	N19 18.1
19	183 01.8	151 11.3	10.9	152 09.0	27.7	109 21.6	06.5	47 21.6	52.4	Atria	108 24.8	S68 59.2
20	198 04.2	166 11.6	11.6	167 09.7	28.3	124 23.4	06.6	62 23.8	52.3	Avior	234 29.5	S59 26.6
21	213 06.7	181 11.8	·· 12.3	182 10.4	·· 29.0	139 25.3	·· 06.7	77 26.1	·· 52.3	Bellatrix	279 01.5	N 6 19.7
22	228 09.2	196 12.1	12.9	197 11.1	29.6	154 27.1	06.8	92 28.3	52.2	Betelgeuse	271 31.0	N 7 24.1
23	243 11.6	211 12.3	13.6	212 11.8	30.3	169 29.0	06.8	107 30.5	52.1			
10 00	258 14.1	226 12.5	N10 14.3	227 12.5	N11 30.9	184 30.8	N22 06.9	122 32.8	N17 52.1	Canopus	264 08.7	S52 41.2
01	273 16.6	241 12.8	14.9	242 13.2	31.6	199 32.6	07.0	137 35.0	52.0	Capella	281 15.0	N45 58.4
02	288 19.0	256 13.0	15.6	257 13.9	32.2	214 34.5	07.0	152 37.2	51.9	Deneb	49 49.6	N45 11.9
03	303 21.5	271 13.2	·· 16.3	272 14.6	·· 32.9	229 36.3	·· 07.1	167 39.5	·· 51.9	Denebola	183 01.3	N14 41.9
04	318 24.0	286 13.5	16.9	287 15.2	33.5	244 38.2	07.2	182 41.7	51.8	Diphda	349 23.2	S18 06.5
05	333 26.4	301 13.7	17.6	302 15.9	34.2	259 40.0	07.2	197 43.9	51.7			
06	348 28.9	316 13.9	N10 18.3	317 16.6	N11 34.8	274 41.9	N22 07.3	212 46.2	N17 51.7	Dubhe	194 25.0	N61 52.6
07	3 31.3	331 14.2	18.9	332 17.3	35.5	289 43.7	07.4	227 48.4	51.6	Elnath	278 47.3	N28 35.2
08	18 33.8	346 14.4	19.6	347 18.0	36.1	304 45.5	07.4	242 50.6	51.5	Eltanin	90 58.2	N51 29.6
F 09	33 36.3	1 14.6	·· 20.3	2 18.7	·· 36.8	319 47.4	·· 07.5	257 52.8	·· 51.5	Enif	34 13.6	N 9 46.3
R 10	48 38.7	16 14.9	21.0	17 19.4	37.4	334 49.2	07.6	272 55.1	51.4	Fomalhaut	15 53.8	S29 44.3
I 11	63 41.2	31 15.1	21.6	32 20.1	38.0	349 51.1	07.6	287 57.3	51.3			
D 12	78 43.7	46 15.3	N10 22.3	47 20.8	N11 38.7	4 52.9	N22 07.7	302 59.5	N17 51.3	Gacrux	172 30.9	S56 59.5
A 13	93 46.1	61 15.5	23.0	62 21.5	39.3	19 54.7	07.8	318 01.8	51.2	Gienah	176 20.1	S17 25.2
Y 14	108 48.6	76 15.8	23.6	77 22.2	40.0	34 56.6	07.8	333 04.0	51.1	Hadar	149 25.9	S60 16.1
15	123 51.1	91 16.0	·· 24.3	92 22.9	·· 40.6	49 58.4	·· 07.9	348 06.2	·· 51.1	Hamal	328 31.6	N23 21.2
16	138 53.5	106 16.2	25.0	107 23.6	41.3	65 00.3	08.0	3 08.5	51.0	Kaus Aust.	84 19.4	S34 23.6
17	153 56.0	121 16.4	25.7	122 24.2	41.9	80 02.1	08.0	18 10.7	50.9			
18	168 58.4	136 16.6	N10 26.3	137 24.9	N11 42.6	95 04.0	N22 08.1	33 12.9	N17 50.9	Kochab	137 18.1	N74 15.1
19	184 00.9	151 16.9	27.0	152 25.6	43.2	110 05.8	08.2	48 15.1	50.8	Markab	14 05.3	N15 05.0
20	199 03.4	166 17.1	27.7	167 26.3	43.9	125 07.6	08.2	63 17.4	50.7	Menkar	314 43.7	N 4 00.0
21	214 05.8	181 17.3	·· 28.4	182 27.0	·· 44.5	140 09.5	·· 08.3	78 19.6	·· 50.7	Menkent	148 39.3	S36 15.7
22	229 08.3	196 17.5	29.0	197 27.7	45.2	155 11.3	08.4	93 21.8	50.6	Miaplacidus	221 45.8	S69 37.9
23	244 10.8	211 17.7	29.7	212 28.4	45.8	170 13.2	08.4	108 24.1	50.5			
11 00	259 13.2	226 17.9	N10 30.4	227 29.1	N11 46.4	185 15.0	N22 08.5	123 26.3	N17 50.5	Mirfak	309 19.7	N49 46.7
01	274 15.7	241 18.2	31.0	242 29.8	47.1	200 16.8	08.6	138 28.5	50.4	Nunki	76 31.6	S26 19.4
02	289 18.2	256 18.4	31.7	257 30.5	47.7	215 18.7	08.6	153 30.7	50.3	Peacock	54 01.5	S56 48.2
03	304 20.6	271 18.6	·· 32.4	272 31.2	·· 48.4	230 20.5	·· 08.7	168 33.0	·· 50.3	Pollux	244 01.2	N28 04.8
04	319 23.1	286 18.8	33.1	287 31.9	49.0	245 22.4	08.8	183 35.2	50.2	Procyon	245 28.4	N 5 16.9
05	334 25.6	301 19.0	33.7	302 32.5	49.7	260 24.2	08.8	198 37.4	50.1			
06	349 28.0	316 19.2	N10 34.4	317 33.2	N11 50.3	275 26.1	N22 08.9	213 39.7	N17 50.1	Rasalhague	96 31.3	N12 34.6
07	4 30.5	331 19.4	35.1	332 33.9	50.9	290 27.9	09.0	228 41.9	50.0	Regulus	208 12.5	N12 04.6
S 08	19 32.9	346 19.6	35.8	347 34.6	51.6	305 29.7	09.0	243 44.1	49.9	Rigel	281 38.5	S 8 13.8
A 09	34 35.4	1 19.8	·· 36.4	2 35.3	·· 52.2	320 31.6	·· 09.1	258 46.3	·· 49.9	Rigil Kent.	140 28.2	S60 44.7
T 10	49 37.9	16 20.0	37.1	17 36.0	52.9	335 33.4	09.2	273 48.6	49.8	Sabik	102 43.3	S15 41.8
U 11	64 40.3	31 20.2	37.8	32 36.7	53.5	350 35.3	09.2	288 50.8	49.7			
R 12	79 42.8	46 20.4	N10 38.5	47 37.4	N11 54.2	5 37.1	N22 09.3	303 53.0	N17 49.7	Schedar	350 11.6	N56 24.6
D 13	94 45.3	61 20.7	39.2	62 38.1	54.8	20 39.0	09.4	318 55.3	49.6	Shaula	96 58.3	S37 05.2
A 14	109 47.7	76 20.9	39.8	77 38.8	55.4	35 40.8	09.4	333 57.5	49.5	Sirius	258 58.0	S16 41.3
Y 15	124 50.2	91 21.1	·· 40.5	92 39.5	·· 56.1	50 42.6	·· 09.5	348 59.7	·· 49.5	Spica	158 59.7	S11 02.7
16	139 52.7	106 21.3	41.2	107 40.2	56.7	65 44.5	09.6	4 01.9	49.4	Suhail	223 12.6	S43 20.8
17	154 55.1	121 21.5	41.9	122 40.8	57.4	80 46.3	09.6	19 04.2	49.3			
18	169 57.6	136 21.7	N10 42.5	137 41.5	N11 58.0	95 48.2	N22 09.7	34 06.4	N17 49.3	Vega	80 56.9	N38 45.8
19	185 00.1	151 21.9	43.2	152 42.2	58.6	110 50.0	09.8	49 08.6	49.2	Zuben'ubi	137 35.2	S15 56.9
20	200 02.5	166 22.1	43.9	167 42.9	59.3	125 51.8	09.8	64 10.8	49.1			
21	215 05.0	181 22.2	·· 44.6	182 43.6	11 59.9	140 53.7	·· 09.9	79 13.1	·· 49.1			
22	230 07.4	196 22.4	45.3	197 44.3	12 00.6	155 55.5	10.0	94 15.3	49.0			
23	245 09.9	211 22.6	45.9	212 45.0	01.2	170 57.4	10.0	109 17.5	48.9			
Mer. Pass.	h m 6 45.9	v 0.2	d 0.7	v 0.7	d 0.6	v 1.8	d 0.1	v 2.2	d 0.1			

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	327 58.4	8 55
Mars	328 58.4	8 51
Jupiter	286 16.7	11 41
Saturn	224 18.7	15 47

G.M.T.		SUN		MOON				
		G.H.A.	Dec.	G.H.A.	v	Dec.	d	H.P.
d	h	° ′	° ′	° ′	′	° ′	′	′
9	00	180 14.4	N22 54.1	265 15.7	13.5	S 0 37.5	10.1	56.1
	01	195 14.3	54.4	279 48.2	13.5	0 27.4	10.2	56.1
	02	210 14.2	54.6	294 20.7	13.6	0 17.2	10.2	56.0
	03	225 14.1	·· 54.8	308 53.3	13.7	S 0 07.0	10.2	56.0
	04	240 13.9	55.0	323 26.0	13.6	N 0 03.2	10.1	56.0
	05	255 13.8	55.2	337 58.6	13.7	0 13.3	10.2	55.9
	06	270 13.7	N22 55.4	352 31.3	13.7	N 0 23.5	10.1	55.9
	07	285 13.6	55.6	7 04.0	13.8	0 33.6	10.1	55.9
T	08	300 13.5	55.8	21 36.8	13.8	0 43.7	10.1	55.8
H	09	315 13.3	·· 56.0	36 09.6	13.8	0 53.8	10.1	55.8
U	10	330 13.2	56.2	50 42.4	13.8	1 03.9	10.1	55.8
R	11	345 13.1	56.4	65 15.2	13.9	1 14.0	10.0	55.8
S	12	0 13.0	N22 56.7	79 48.1	13.9	N 1 24.0	10.1	55.7
D	13	15 12.9	56.9	94 21.0	13.9	1 34.1	10.0	55.7
A	14	30 12.7	57.1	108 53.9	13.9	1 44.1	10.0	55.7
Y	15	45 12.6	·· 57.3	123 26.8	14.0	1 54.1	10.0	55.6
	16	60 12.5	57.5	137 59.8	14.0	2 04.1	9.9	55.6
	17	75 12.4	57.7	152 32.8	14.0	2 14.0	10.0	55.6
	18	90 12.2	N22 57.9	167 05.8	14.0	N 2 24.0	9.9	55.6
	19	105 12.1	58.1	181 38.8	14.0	2 33.9	9.9	55.5
	20	120 12.0	58.3	196 11.8	14.1	2 43.8	9.9	55.5
	21	135 11.9	·· 58.5	210 44.9	14.1	2 53.7	9.9	55.5
	22	150 11.7	58.7	225 18.0	14.1	3 03.6	9.8	55.4
	23	165 11.6	58.9	239 51.1	14.1	3 13.4	9.8	55.4
10	00	180 11.5	N22 59.1	254 24.2	14.2	N 3 23.2	9.8	55.4
	01	195 11.4	59.3	268 57.4	14.1	3 33.0	9.8	55.4
	02	210 11.2	59.5	283 30.5	14.2	3 42.8	9.7	55.3
	03	225 11.1	·· 59.7	298 03.7	14.2	3 52.5	9.8	55.3
	04	240 11.0	22 59.8	312 36.9	14.2	4 02.3	9.7	55.3
	05	255 10.9	23 00.0	327 10.1	14.2	4 12.0	9.6	55.3
	06	270 10.8	N23 00.2	341 43.3	14.2	N 4 21.6	9.7	55.2
	07	285 10.6	00.4	356 16.5	14.2	4 31.3	9.6	55.2
	08	300 10.5	00.6	10 49.7	14.3	4 40.9	9.6	55.2
F	09	315 10.4	·· 00.8	25 23.0	14.2	4 50.5	9.5	55.2
R	10	330 10.3	01.0	39 56.2	14.3	5 00.0	9.6	55.1
I	11	345 10.1	01.2	54 29.5	14.3	5 09.6	9.5	55.1
D	12	0 10.0	N23 01.4	69 02.8	14.2	N 5 19.1	9.4	55.1
A	13	15 09.9	01.6	83 36.0	14.3	5 28.5	9.5	55.1
Y	14	30 09.8	01.8	98 09.3	14.3	5 38.0	9.4	55.1
	15	45 09.6	·· 01.9	112 42.6	14.3	5 47.4	9.4	55.0
	16	60 09.5	02.1	127 15.9	14.3	5 56.8	9.3	55.0
	17	75 09.4	02.3	141 49.2	14.3	6 06.1	9.3	55.0
	18	90 09.3	N23 02.5	156 22.5	14.3	N 6 15.4	9.3	55.0
	19	105 09.1	02.7	170 55.8	14.4	6 24.7	9.2	54.9
	20	120 09.0	02.9	185 29.2	14.3	6 33.9	9.3	54.9
	21	135 08.9	·· 03.0	200 02.5	14.3	6 43.2	9.1	54.9
	22	150 08.8	03.2	214 35.8	14.3	6 52.3	9.2	54.9
	23	165 08.6	03.4	229 09.1	14.4	7 01.5	9.1	54.9
11	00	180 08.5	N23 03.6	243 42.5	14.3	N 7 10.6	9.0	54.8
	01	195 08.4	03.8	258 15.8	14.3	7 19.6	9.1	54.8
	02	210 08.2	03.9	272 49.1	14.3	7 28.7	9.0	54.8
	03	225 08.1	·· 04.1	287 22.4	14.3	7 37.7	8.9	54.8
	04	240 08.0	04.3	301 55.7	14.4	7 46.6	8.9	54.8
	05	255 07.9	04.5	316 29.1	14.3	7 55.5	8.9	54.7
	06	270 07.7	N23 04.7	331 02.4	14.3	N 8 04.4	8.8	54.7
	07	285 07.6	04.8	345 35.7	14.3	8 13.2	8.8	54.7
S	08	300 07.5	05.0	0 09.0	14.3	8 22.0	8.8	54.7
A	09	315 07.4	·· 05.2	14 42.3	14.3	8 30.8	8.7	54.7
T	10	330 07.2	05.4	29 15.6	14.3	8 39.5	8.7	54.6
U	11	345 07.1	05.5	43 48.9	14.3	8 48.2	8.6	54.6
R	12	0 07.0	N23 05.7	58 22.2	14.3	N 8 56.8	8.6	54.6
D	13	15 06.8	05.9	72 55.5	14.2	9 05.4	8.5	54.6
A	14	30 06.7	06.0	87 28.7	14.3	9 13.9	8.5	54.6
Y	15	45 06.6	·· 06.2	102 02.0	14.2	9 22.4	8.5	54.6
	16	60 06.5	06.4	116 35.2	14.3	9 30.9	8.4	54.5
	17	75 06.3	06.5	131 08.5	14.2	9 39.3	8.4	54.5
	18	90 06.2	N23 06.7	145 41.7	14.3	N 9 47.7	8.3	54.5
	19	105 06.1	06.9	160 15.0	14.2	9 56.0	8.3	54.5
	20	120 06.0	07.0	174 48.2	14.2	10 04.3	8.2	54.5
	21	135 05.8	·· 07.2	189 21.4	14.2	10 12.5	8.2	54.5
	22	150 05.7	07.4	203 54.6	14.2	10 20.7	8.1	54.5
	23	165 05.6	07.5	218 27.8	14.1	10 28.8	8.1	54.4
		S.D. 15.8	d 0.2	S.D. 15.2		15.0		14.9

Lat.	Twilight		Sunrise	Moonrise			
	Naut.	Civil		9	10	11	12
°	h m	h m	h m	h m	h m	h m	h m
N 72	▭	▭	▭	00 28	00 22	00 15	00 08
N 70	▭	▭	▭	00 27	00 26	00 25	00 25
68	▭	▭	▭	00 26	00 30	00 34	00 39
66	////	////	00 29	00 26	00 33	00 41	00 50
64	////	////	01 39	00 25	00 36	00 47	00 59
62	////	////	02 14	00 25	00 38	00 52	01 07
60	////	01 03	02 39	00 24	00 40	00 56	01 14
N 58	////	01 46	02 59	00 24	00 42	01 00	01 20
56	////	02 14	03 15	00 24	00 44	01 04	01 25
54	00 57	02 35	03 29	00 24	00 45	01 07	01 30
52	01 37	02 53	03 41	00 23	00 46	01 10	01 35
50	02 03	03 07	03 51	00 23	00 48	01 13	01 39
45	02 47	03 36	04 13	00 23	00 50	01 18	01 47
N 40	03 17	03 58	04 31	00 22	00 53	01 23	01 55
35	03 39	04 16	04 45	00 22	00 55	01 27	02 01
30	03 58	04 31	04 58	00 21	00 56	01 31	02 07
20	04 26	04 55	05 20	00 21	00 59	01 38	02 16
N 10	04 48	05 15	05 38	00 20	01 02	01 43	02 25
0	05 07	05 33	05 56	00 20	01 05	01 49	02 33
S 10	05 24	05 50	06 13	00 20	01 07	01 54	02 41
20	05 40	06 07	06 31	00 19	01 10	02 00	02 50
30	05 56	06 25	06 52	00 19	01 13	02 07	03 00
35	06 04	06 36	07 04	00 18	01 15	02 11	03 05
40	06 13	06 47	07 18	00 18	01 17	02 15	03 12
45	06 23	07 01	07 34	00 18	01 20	02 20	03 20
S 50	06 35	07 16	07 54	00 17	01 23	02 26	03 29
52	06 40	07 23	08 04	00 17	01 24	02 29	03 33
54	06 45	07 31	08 15	00 17	01 26	02 32	03 38
56	06 51	07 40	08 27	00 17	01 27	02 36	03 43
58	06 58	07 50	08 41	00 17	01 29	02 40	03 49
S 60	07 05	08 02	08 58	00 16	01 31	02 44	03 56

Lat.	Sunset	Twilight		Moonset			
		Civil	Naut.	9	10	11	12
°	h m	h m	h m	h m	h m	h m	h m
N 72	▭	▭	▭	13 01	14 39	16 18	17 58
N 70	▭	▭	▭	12 58	14 31	16 02	17 33
68	▭	▭	▭	12 57	14 24	15 50	17 15
66	23 36	////	////	12 55	14 19	15 40	17 00
64	22 21	////	////	12 54	14 14	15 32	16 48
62	21 45	////	////	12 53	14 10	15 25	16 38
60	21 20	22 58	////	12 52	14 06	15 18	16 29
N 58	21 01	22 14	////	12 51	14 03	15 13	16 21
56	20 44	21 45	////	12 51	14 00	15 08	16 14
54	20 30	21 24	23 03	12 50	13 58	15 04	16 08
52	20 18	21 07	22 22	12 49	13 56	15 00	16 03
50	20 08	20 52	21 56	12 49	13 53	14 56	15 58
45	19 46	20 23	21 12	12 48	13 49	14 49	15 48
N 40	19 28	20 01	20 42	12 47	13 45	14 43	15 39
35	19 13	19 43	20 19	12 46	13 42	14 37	15 31
30	19 01	19 28	20 01	12 45	13 39	14 32	15 25
20	18 39	19 03	19 33	12 44	13 34	14 24	15 13
N 10	18 20	18 43	19 10	12 43	13 30	14 17	15 04
0	18 03	18 25	18 52	12 42	13 26	14 10	14 54
S 10	17 46	18 09	18 35	12 41	13 22	14 03	14 45
20	17 28	17 52	18 19	12 39	13 18	13 56	14 35
30	17 07	17 33	18 03	12 38	13 13	13 48	14 24
35	16 55	17 23	17 54	12 37	13 10	13 43	14 18
40	16 41	17 11	17 45	12 36	13 07	13 38	14 10
45	16 24	16 58	17 35	12 35	13 03	13 32	14 02
S 50	16 04	16 42	17 24	12 34	12 59	13 24	13 51
52	15 54	16 35	17 19	12 33	12 57	13 21	13 47
54	15 44	16 27	17 13	12 33	12 54	13 17	13 42
56	15 31	16 18	17 07	12 32	12 52	13 13	13 36
58	15 17	16 08	17 00	12 31	12 49	13 08	13 29
S 60	15 00	15 57	16 53	12 31	12 46	13 03	13 22

Day	SUN			MOON			
	Eqn. of Time 00ʰ	12ʰ	Mer. Pass.	Mer. Pass. Upper	Lower	Age	Phase
	m s	m s	h m	h m	h m	d	
9	00 58	00 52	11 59	06 31	18 53	22	
10	00 46	00 40	11 59	07 15	19 37	23	◑
11	00 34	00 28	12 00	07 59	20 21	24	

1977 JUNE 12, 13, 14 (SUN., MON., TUES.)

G.M.T.	ARIES	VENUS −4.0		MARS +1.3		JUPITER −1.5		SATURN +0.6	
	G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
d h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
12 00	260 12.4	226 22.8	N10 46.6	227 45.7	N12 01.8	185 59.2	N22 10.1	124 19.8	N17 48.9
01	275 14.8	241 23.0	47.3	242 46.4	02.5	201 01.1	10.2	139 22.0	48.8
02	290 17.3	256 23.2	48.0	257 47.1	03.1	216 02.9	10.2	154 24.2	48.7
03	305 19.8	271 23.4	·· 48.7	272 47.7	·· 03.7	231 04.7	·· 10.3	169 26.4	·· 48.7
04	320 22.2	286 23.6	49.3	287 48.4	04.4	246 06.6	10.4	184 28.7	48.6
05	335 24.7	301 23.8	50.0	302 49.1	05.0	261 08.4	10.4	199 30.9	48.5
06	350 27.2	316 24.0	N10 50.7	317 49.8	N12 05.7	276 10.3	N22 10.5	214 33.1	N17 48.5
07	5 29.6	331 24.2	51.4	332 50.5	06.3	291 12.1	10.6	229 35.3	48.4
08	20 32.1	346 24.4	52.1	347 51.2	06.9	306 14.0	10.6	244 37.6	48.3
S 09	35 34.5	1 24.5	·· 52.7	2 51.9	·· 07.6	321 15.8	·· 10.7	259 39.8	·· 48.3
U 10	50 37.0	16 24.7	53.4	17 52.6	08.2	336 17.6	10.8	274 42.0	48.2
N 11	65 39.5	31 24.9	54.1	32 53.3	08.8	351 19.5	10.8	289 44.2	48.1
D 12	80 41.9	46 25.1	N10 54.8	47 54.0	N12 09.5	6 21.3	N22 10.9	304 46.5	N17 48.0
A 13	95 44.4	61 25.3	55.5	62 54.7	10.1	21 23.2	11.0	319 48.7	48.0
Y 14	110 46.9	76 25.5	56.1	77 55.3	10.8	36 25.0	11.0	334 50.9	47.9
15	125 49.3	91 25.6	·· 56.8	92 56.0	·· 11.4	51 26.9	·· 11.1	349 53.1	·· 47.8
16	140 51.8	106 25.8	57.5	107 56.7	12.0	66 28.7	11.2	4 55.4	47.8
17	155 54.3	121 26.0	58.2	122 57.4	12.7	81 30.5	11.2	19 57.6	47.7
18	170 56.7	136 26.2	N10 58.9	137 58.1	N12 13.3	96 32.4	N22 11.3	34 59.8	N17 47.6
19	185 59.2	151 26.4	10 59.6	152 58.8	13.9	111 34.2	11.4	50 02.0	47.6
20	201 01.7	166 26.5	11 00.2	167 59.5	14.6	126 36.1	11.4	65 04.3	47.5
21	216 04.1	181 26.7	·· 00.9	183 00.2	·· 15.2	141 37.9	·· 11.5	80 06.5	·· 47.4
22	231 06.6	196 26.9	01.6	198 00.9	15.8	156 39.8	11.6	95 08.7	47.4
23	246 09.0	211 27.1	02.3	213 01.5	16.5	171 41.6	11.6	110 10.9	47.3
13 00	261 11.5	226 27.2	N11 03.0	228 02.2	N12 17.1	186 43.4	N22 11.7	125 13.2	N17 47.2
01	276 14.0	241 27.4	03.7	243 02.9	17.7	201 45.3	11.8	140 15.4	47.2
02	291 16.4	256 27.6	04.3	258 03.6	18.4	216 47.1	11.8	155 17.6	47.1
03	306 18.9	271 27.7	·· 05.0	273 04.3	·· 19.0	231 49.0	·· 11.9	170 19.8	·· 47.0
04	321 21.4	286 27.9	05.7	288 05.0	19.6	246 50.8	11.9	185 22.0	47.0
05	336 23.8	301 28.1	06.4	303 05.7	20.3	261 52.6	12.0	200 24.3	46.9
06	351 26.3	316 28.3	N11 07.1	318 06.4	N12 20.9	276 54.5	N22 12.1	215 26.5	N17 46.8
07	6 28.8	331 28.4	07.8	333 07.1	21.5	291 56.3	12.1	230 28.7	46.8
08	21 31.2	346 28.6	08.5	348 07.8	22.2	306 58.2	12.2	245 30.9	46.7
M 09	36 33.7	1 28.8	·· 09.1	3 08.4	·· 22.8	322 00.0	·· 12.3	260 33.2	·· 46.6
O 10	51 36.2	16 28.9	09.8	18 09.1	23.4	337 01.9	12.3	275 35.4	46.5
N 11	66 38.6	31 29.1	10.5	33 09.8	24.1	352 03.7	12.4	290 37.6	46.5
D 12	81 41.1	46 29.3	N11 11.2	48 10.5	N12 24.7	7 05.5	N22 12.5	305 39.8	N17 46.4
A 13	96 43.5	61 29.4	11.9	63 11.2	25.3	22 07.4	12.5	320 42.1	46.3
Y 14	111 46.0	76 29.6	12.6	78 11.9	25.9	37 09.2	12.6	335 44.3	46.3
15	126 48.5	91 29.7	·· 13.3	93 12.6	·· 26.6	52 11.1	·· 12.7	350 46.5	·· 46.2
16	141 50.9	106 29.9	13.9	108 13.3	27.2	67 12.9	12.7	5 48.7	46.1
17	156 53.4	121 30.1	14.6	123 14.0	27.8	82 14.8	12.8	20 50.9	46.1
18	171 55.9	136 30.2	N11 15.3	138 14.6	N12 28.5	97 16.6	N22 12.9	35 53.2	N17 46.0
19	186 58.3	151 30.4	16.0	153 15.3	29.1	112 18.4	12.9	50 55.4	45.9
20	202 00.8	166 30.5	16.7	168 16.0	29.7	127 20.3	13.0	65 57.6	45.9
21	217 03.3	181 30.7	·· 17.4	183 16.7	·· 30.4	142 22.1	·· 13.0	80 59.8	·· 45.8
22	232 05.7	196 30.8	18.1	198 17.4	31.0	157 24.0	13.1	96 02.0	45.7
23	247 08.2	211 31.0	18.8	213 18.1	31.6	172 25.8	13.2	111 04.3	45.7
14 00	262 10.6	226 31.1	N11 19.4	228 18.8	N12 32.2	187 27.7	N22 13.2	126 06.5	N17 45.6
01	277 13.1	241 31.3	20.1	243 19.5	32.9	202 29.5	13.3	141 08.7	45.5
02	292 15.6	256 31.5	20.8	258 20.2	33.5	217 31.3	13.4	156 10.9	45.4
03	307 18.0	271 31.6	·· 21.5	273 20.8	·· 34.1	232 33.2	·· 13.4	171 13.2	·· 45.4
04	322 20.5	286 31.8	22.2	288 21.5	34.7	247 35.0	13.5	186 15.4	45.3
05	337 23.0	301 31.9	22.9	303 22.2	35.4	262 36.9	13.6	201 17.6	45.2
06	352 25.4	316 32.1	N11 23.6	318 22.9	N12 36.0	277 38.7	N22 13.6	216 19.8	N17 45.2
07	7 27.9	331 32.2	24.3	333 23.6	36.6	292 40.6	13.7	231 22.0	45.1
08	22 30.4	346 32.3	25.0	348 24.3	37.3	307 42.4	13.7	246 24.3	45.0
T 09	37 32.8	1 32.5	·· 25.6	3 25.0	·· 37.9	322 44.2	·· 13.8	261 26.5	·· 45.0
U 10	52 35.3	16 32.6	26.3	18 25.7	38.5	337 46.1	13.9	276 28.7	44.9
E 11	67 37.8	31 32.8	27.0	33 26.3	39.1	352 47.9	13.9	291 30.9	44.8
S 12	82 40.2	46 32.9	N11 27.7	48 27.0	N12 39.8	7 49.8	N22 14.0	306 33.1	N17 44.8
D 13	97 42.7	61 33.1	28.4	63 27.7	40.4	22 51.6	14.1	321 35.4	44.7
A 14	112 45.1	76 33.2	29.1	78 28.4	41.0	37 53.5	14.1	336 37.6	44.6
Y 15	127 47.6	91 33.4	·· 29.8	93 29.1	·· 41.6	52 55.3	·· 14.2	351 39.8	·· 44.5
16	142 50.1	106 33.5	30.5	108 29.8	42.3	67 57.1	14.3	6 42.0	44.5
17	157 52.5	121 33.6	31.2	123 30.5	42.9	82 59.0	14.3	21 44.2	44.4
18	172 55.0	136 33.8	N11 31.9	138 31.2	N12 43.5	98 00.8	N22 14.4	36 46.5	N17 44.3
19	187 57.5	151 33.9	32.5	153 31.8	44.1	113 02.7	14.4	51 48.7	44.3
20	202 59.9	166 34.0	33.2	168 32.5	44.7	128 04.5	14.5	66 50.9	44.2
21	218 02.4	181 34.2	·· 33.9	183 33.2	·· 45.4	143 06.4	·· 14.6	81 53.1	·· 44.1
22	233 04.9	196 34.3	34.6	198 33.9	46.0	158 08.2	14.6	96 55.3	44.1
23	248 07.3	211 34.5	35.3	213 34.6	46.6	173 10.0	14.7	111 57.5	44.0
Mer. Pass.	h m 6 34.2	v 0.2	d 0.7	v 0.7	d 0.6	v 1.8	d 0.1	v 2.2	d 0.1

STARS

Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 39.3	S40 23.6
Achernar	335 47.3	S57 20.8
Acrux	173 39.4	S62 58.8
Adhara	255 34.2	S28 56.7
Aldebaran	291 20.9	N16 27.7
Alioth	166 44.3	N56 05.2
Alkaid	153 20.0	N49 25.8
Al Na'ir	28 17.6	S47 03.9
Alnilam	276 14.2	S 1 13.1
Alphard	218 22.9	S 8 33.8
Alphecca	126 33.7	N26 47.5
Alpheratz	358 11.6	N28 57.8
Altair	62 34.4	N 8 48.6
Ankaa	353 42.6	S42 25.5
Antares	112 59.2	S26 22.9
Arcturus	146 20.3	N19 18.1
Atria	108 24.8	S68 59.2
Avior	234 29.5	S59 26.5
Bellatrix	279 01.4	N 6 19.7
Betelgeuse	271 31.0	N 7 24.1
Canopus	264 08.7	S52 41.2
Capella	281 15.0	N45 58.4
Deneb	49 49.6	N45 11.9
Denebola	183 01.3	N14 41.9
Diphda	349 23.2	S18 06.5
Dubhe	194 25.0	N61 52.6
Elnath	278 47.3	N28 35.2
Eltanin	90 58.2	N51 29.6
Enif	34 13.6	N 9 46.3
Fomalhaut	15 53.8	S29 44.3
Gacrux	172 30.9	S56 59.5
Gienah	176 20.1	S17 25.2
Hadar	149 25.9	S60 16.1
Hamal	328 31.6	N23 21.2
Kaus Aust.	84 19.4	S34 23.6
Kochab	137 18.1	N74 15.1
Markab	14 05.3	N15 05.0
Menkar	314 43.7	N 4 00.0
Menkent	148 39.3	S36 15.7
Miaplacidus	221 45.8	S69 37.8
Mirfak	309 19.6	N49 46.7
Nunki	76 31.6	S26 19.4
Peacock	54 01.5	S56 48.2
Pollux	244 01.2	N28 04.8
Procyon	245 28.4	N 5 16.9
Rasalhague	96 31.3	N12 34.7
Regulus	208 12.5	N12 04.6
Rigel	281 38.5	S 8 13.8
Rigil Kent.	140 28.2	S60 44.7
Sabik	102 43.3	S15 41.8
Schedar	350 11.6	N56 24.6
Shaula	96 58.3	S37 05.2
Sirius	258 58.0	S16 41.3
Spica	158 59.7	S11 02.7
Suhail	223 12.6	S43 20.8
Vega	80 56.9	N38 45.8
Zuben'ubi	137 35.2	S15 56.9

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	325 15.7	8 54
Mars	326 50.7	8 47
Jupiter	285 31.9	11 32
Saturn	224 01.6	15 37

G.M.T.		SUN		MOON				
		G.H.A.	Dec.	G.H.A.	v	Dec.	d	H.P.
d	h	° ′	° ′	° ′	′	° ′	′	′
12	00	180 05.4	N23 07.7	233 00.9	14.2	N10 36.9	8.0	54.4
	01	195 05.3	07.9	247 34.1	14.1	10 44.9	8.0	54.4
	02	210 05.2	08.0	262 07.2	14.2	10 52.9	8.0	54.4
	03	225 05.1	·· 08.2	276 40.4	14.1	11 00.9	7.9	54.4
	04	240 04.9	08.4	291 13.5	14.1	11 08.8	7.8	54.4
	05	255 04.8	08.5	305 46.6	14.1	11 16.6	7.8	54.4
	06	270 04.7	N23 08.7	320 19.7	14.1	N11 24.4	7.7	54.3
	07	285 04.5	08.8	334 52.8	14.0	11 32.1	7.7	54.3
	08	300 04.4	09.0	349 25.8	14.1	11 39.8	7.6	54.3
S	09	315 04.3	·· 09.1	3 58.9	14.0	11 47.4	7.6	54.3
U	10	330 04.1	09.3	18 31.9	14.0	11 55.0	7.5	54.3
N	11	345 04.0	09.5	33 04.9	14.0	12 02.5	7.5	54.3
D	12	0 03.9	N23 09.6	47 37.9	14.0	N12 10.0	7.4	54.3
A	13	15 03.8	09.8	62 10.9	13.9	12 17.4	7.4	54.3
Y	14	30 03.6	09.9	76 43.8	14.0	12 24.8	7.3	54.2
	15	45 03.5	·· 10.1	91 16.8	13.9	12 32.1	7.3	54.2
	16	60 03.4	10.2	105 49.7	13.9	12 39.4	7.2	54.2
	17	75 03.2	10.4	120 22.6	13.9	12 46.6	7.1	54.2
	18	90 03.1	N23 10.5	134 55.5	13.8	N12 53.7	7.1	54.2
	19	105 03.0	10.7	149 28.3	13.9	13 00.8	7.0	54.2
	20	120 02.9	10.8	164 01.2	13.8	13 07.8	7.0	54.2
	21	135 02.7	·· 11.0	178 34.0	13.8	13 14.8	6.9	54.2
	22	150 02.6	11.1	193 06.8	13.8	13 21.7	6.8	54.2
	23	165 02.5	11.3	207 39.6	13.7	13 28.5	6.8	54.2
13	00	180 02.3	N23 11.4	222 12.3	13.8	N13 35.3	6.7	54.1
	01	195 02.2	11.6	236 45.1	13.7	13 42.0	6.7	54.1
	02	210 02.1	11.7	251 17.8	13.7	13 48.7	6.6	54.1
	03	225 01.9	·· 11.8	265 50.5	13.7	13 55.3	6.6	54.1
	04	240 01.8	12.0	280 23.2	13.6	14 01.9	6.4	54.1
	05	255 01.7	12.1	294 55.8	13.7	14 08.3	6.5	54.1
	06	270 01.5	N23 12.3	309 28.5	13.6	N14 14.8	6.3	54.1
	07	285 01.4	12.4	324 01.1	13.6	14 21.1	6.3	54.1
	08	300 01.3	12.6	338 33.7	13.5	14 27.4	6.2	54.1
M	09	315 01.1	·· 12.7	353 06.2	13.6	14 33.6	6.2	54.1
O	10	330 01.0	12.8	7 38.8	13.5	14 39.8	6.1	54.1
N	11	345 00.9	13.0	22 11.3	13.5	14 45.9	6.1	54.1
D	12	0 00.8	N23 13.1	36 43.8	13.4	N14 52.0	5.9	54.1
A	13	15 00.6	13.3	51 16.2	13.5	14 57.9	5.9	54.1
Y	14	30 00.5	13.4	65 48.7	13.4	15 03.8	5.9	54.0
	15	45 00.4	·· 13.5	80 21.1	13.4	15 09.7	5.7	54.0
	16	60 00.2	13.7	94 53.5	13.4	15 15.4	5.8	54.0
	17	75 00.1	13.8	109 25.9	13.4	15 21.2	5.6	54.0
	18	90 00.0	N23 13.9	123 58.3	13.3	N15 26.8	5.6	54.0
	19	104 59.8	14.1	138 30.6	13.3	15 32.4	5.5	54.0
	20	119 59.7	14.2	153 02.9	13.3	15 37.9	5.4	54.0
	21	134 59.6	·· 14.3	167 35.2	13.3	15 43.3	5.4	54.0
	22	149 59.4	14.5	182 07.5	13.2	15 48.7	5.3	54.0
	23	164 59.3	14.6	196 39.7	13.2	15 54.0	5.2	54.0
14	00	179 59.2	N23 14.7	211 11.9	13.2	N15 59.2	5.1	54.0
	01	194 59.0	14.8	225 44.1	13.2	16 04.3	5.1	54.0
	02	209 58.9	15.0	240 16.3	13.1	16 09.4	5.0	54.0
	03	224 58.8	·· 15.1	254 48.4	13.1	16 14.4	5.0	54.0
	04	239 58.6	15.2	269 20.5	13.1	16 19.4	4.8	54.0
	05	254 58.5	15.4	283 52.6	13.1	16 24.2	4.8	54.0
	06	269 58.4	N23 15.5	298 24.7	13.0	N16 29.0	4.8	54.0
	07	284 58.2	15.6	312 56.7	13.0	16 33.8	4.6	54.0
T	08	299 58.1	15.7	327 28.7	13.0	16 38.4	4.6	54.0
U	09	314 58.0	·· 15.8	342 00.7	13.0	16 43.0	4.5	54.0
E	10	329 57.8	16.0	356 32.7	13.0	16 47.5	4.4	54.0
S	11	344 57.7	16.1	11 04.7	12.9	16 51.9	4.4	54.0
D	12	359 57.6	N23 16.2	25 36.6	12.9	N16 56.3	4.2	54.0
A	13	14 57.4	16.3	40 08.5	12.9	17 00.5	4.2	54.0
Y	14	29 57.3	16.5	54 40.4	12.8	17 04.7	4.2	54.0
	15	44 57.2	·· 16.6	69 12.2	12.9	17 08.9	4.0	54.0
	16	59 57.0	16.7	83 44.1	12.8	17 12.9	4.0	54.0
	17	74 56.9	16.8	98 15.9	12.8	17 16.9	3.9	54.0
	18	89 56.8	N23 16.9	112 47.7	12.7	N17 20.8	3.8	54.0
	19	104 56.6	17.0	127 19.4	12.8	17 24.6	3.7	54.0
	20	119 56.5	17.2	141 51.2	12.7	17 28.3	3.7	54.0
	21	134 56.4	·· 17.3	156 22.9	12.7	17 32.0	3.6	54.0
	22	149 56.2	17.4	170 54.6	12.7	17 35.6	3.5	54.0
	23	164 56.1	17.5	185 26.3	12.6	17 39.1	3.4	54.0
		S.D. 15.8	d 0.1	S.D. 14.8		14.7		14.7

Lat.	Twilight		Sunrise	Moonrise			
	Naut.	Civil		12	13	14	15
°	h m	h m	h m	h m	h m	h m	h m
N 72	□	□	□	00 08	{ 00 01 23 50 }	23 30	□
N 70	□	□	□	00 25	00 26	00 29	00 37
68	□	□	□	00 39	00 46	00 56	01 14
66	□	□	□	00 50	01 01	01 17	01 40
64	////	////	01 35	00 59	01 14	01 34	02 00
62	////	////	02 11	01 07	01 25	01 48	02 16
60	////	00 57	02 37	01 14	01 34	01 59	02 30
N 58	////	01 43	02 57	01 20	01 43	02 09	02 42
56	////	02 12	03 14	01 25	01 50	02 18	02 52
54	00 52	02 34	03 28	01 30	01 56	02 26	03 01
52	01 35	02 51	03 40	01 35	02 02	02 33	03 09
50	02 01	03 06	03 50	01 39	02 07	02 40	03 16
45	02 46	03 35	04 13	01 47	02 19	02 53	03 32
N 40	03 16	03 58	04 30	01 55	02 28	03 05	03 45
35	03 39	04 16	04 45	02 01	02 37	03 15	03 56
30	03 58	04 31	04 58	02 07	02 44	03 23	04 05
20	04 26	04 56	05 20	02 16	02 56	03 38	04 22
N 10	04 49	05 16	05 39	02 25	03 07	03 51	04 36
0	05 08	05 34	05 56	02 33	03 18	04 03	04 50
S 10	05 24	05 51	06 14	02 41	03 28	04 15	05 03
20	05 40	06 08	06 32	02 50	03 39	04 28	05 18
30	05 57	06 27	06 53	03 00	03 52	04 43	05 34
35	06 05	06 37	07 05	03 05	03 59	04 52	05 44
40	06 15	06 49	07 19	03 12	04 08	05 02	05 55
45	06 25	07 02	07 36	03 20	04 18	05 14	06 08
S 50	06 36	07 18	07 56	03 29	04 30	05 28	06 24
52	06 42	07 25	08 06	03 33	04 35	05 35	06 32
54	06 47	07 33	08 17	03 38	04 41	05 42	06 40
56	06 53	07 42	08 30	03 43	04 48	05 51	06 49
58	07 00	07 52	08 44	03 49	04 56	06 00	07 00
S 60	07 07	08 04	09 01	03 56	05 05	06 11	07 12

Lat.	Sunset	Twilight		Moonset			
		Civil	Naut.	12	13	14	15
°	h m	h m	h m	h m	h m	h m	h m
N 72	□	□	□	17 58	19 42	21 39	□
N 70	□	□	□	17 33	19 04	20 32	21 50
68	□	□	□	17 15	18 37	19 56	21 04
66	□	□	□	17 00	18 17	19 30	20 34
64	22 26	////	////	16 48	18 01	19 10	20 12
62	21 49	////	////	16 38	17 48	18 54	19 54
60	21 23	23 05	////	16 29	17 37	18 41	19 39
N 58	21 03	22 18	////	16 21	17 27	18 29	19 26
56	20 47	21 49	////	16 14	17 18	18 19	19 15
54	20 33	21 27	23 10	16 08	17 11	18 10	19 06
52	20 20	21 09	22 26	16 03	17 04	18 03	18 57
50	20 10	20 54	21 59	15 58	16 58	17 55	18 50
45	19 47	20 25	21 14	15 48	16 45	17 40	18 33
N 40	19 30	20 02	20 44	15 39	16 34	17 28	18 20
35	19 15	19 44	20 21	15 31	16 25	17 17	18 08
30	19 02	19 29	20 02	15 25	16 17	17 08	17 58
20	18 40	19 04	19 34	15 13	16 03	16 52	17 41
N 10	18 21	18 44	19 11	15 04	15 51	16 38	17 26
0	18 04	18 26	18 52	14 54	15 39	16 25	17 12
S 10	17 46	18 09	18 35	14 45	15 28	16 13	16 59
20	17 28	17 52	18 19	14 35	15 16	15 59	16 44
30	17 07	17 33	18 03	14 24	15 02	15 43	16 27
35	16 55	17 23	17 54	14 18	14 54	15 34	16 17
40	16 41	17 11	17 45	14 10	14 45	15 23	16 05
45	16 24	16 58	17 35	14 02	14 35	15 11	15 52
S 50	16 03	16 42	17 23	13 51	14 22	14 56	15 36
52	15 54	16 34	17 18	13 47	14 16	14 49	15 28
54	15 43	16 26	17 12	13 42	14 09	14 42	15 19
56	15 30	16 17	17 06	13 36	14 02	14 33	15 10
58	15 16	16 07	17 00	13 29	13 54	14 23	14 59
S 60	14 59	15 56	16 52	13 22	13 45	14 12	14 47

Day	SUN			MOON			
	Eqn. of Time		Mer. Pass.	Mer. Pass.		Age	Phase
	00ʰ	12ʰ		Upper	Lower		
	m s	m s	h m	h m	h m	d	
12	00 22	00 16	12 00	08 44	21 06	25	
13	00 10	00 03	12 00	09 28	21 51	26	🌘
14	00 03	00 09	12 00	10 14	22 38	27	

G.M.T.		ARIES	VENUS −3.9		MARS +1.3		JUPITER −1.5		SATURN +0.6	
d h		G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
		° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
15 00		263 09.8	226 34.6	N11 36.0	228 35.3	N12 47.2	188 11.9	N22 14.8	126 59.8	N17 43.9
01		278 12.3	241 34.7	36.7	243 36.0	47.9	203 13.7	14.8	142 02.0	43.8
02		293 14.7	256 34.9	37.4	258 36.7	48.5	218 15.6	14.9	157 04.2	43.8
03		308 17.2	271 35.0	·· 38.1	273 37.3	·· 49.1	233 17.4	·· 14.9	172 06.4	·· 43.7
04		323 19.6	286 35.1	38.8	288 38.0	49.7	248 19.3	15.0	187 08.6	43.6
05		338 22.1	301 35.2	39.5	303 38.7	50.3	263 21.1	15.1	202 10.9	43.6
06		353 24.6	316 35.4	N11 40.1	318 39.4	N12 51.0	278 23.0	N22 15.1	217 13.1	N17 43.5
07	W	8 27.0	331 35.5	40.8	333 40.1	51.6	293 24.8	15.2	232 15.3	43.4
08	E	23 29.5	346 35.6	41.5	348 40.8	52.2	308 26.6	15.3	247 17.5	43.4
09	D	38 32.0	1 35.8	·· 42.2	3 41.5	·· 52.8	323 28.5	·· 15.3	262 19.7	·· 43.3
10	N	53 34.4	16 35.9	42.9	18 42.2	53.4	338 30.3	15.4	277 21.9	43.2
11	E	68 36.9	31 36.0	43.6	33 42.8	54.1	353 32.2	15.5	292 24.2	43.1
12	S	83 39.4	46 36.1	N11 44.3	48 43.5	N12 54.7	8 34.0	N22 15.5	307 26.4	N17 43.1
13	D	98 41.8	61 36.3	45.0	63 44.2	55.3	23 35.9	15.6	322 28.6	43.0
14	A	113 44.3	76 36.4	45.7	78 44.9	55.9	38 37.7	15.6	337 30.8	42.9
15	Y	128 46.7	91 36.5	·· 46.4	93 45.6	·· 56.5	53 39.5	·· 15.7	352 33.0	·· 42.9
16		143 49.2	106 36.6	47.1	108 46.3	57.2	68 41.4	15.8	7 35.2	42.8
17		158 51.7	121 36.7	47.8	123 47.0	57.8	83 43.2	15.8	22 37.5	42.7
18		173 54.1	136 36.9	N11 48.5	138 47.6	N12 58.4	98 45.1	N22 15.9	37 39.7	N17 42.7
19		188 56.6	151 37.0	49.1	153 48.3	59.0	113 46.9	15.9	52 41.9	42.6
20		203 59.1	166 37.1	49.8	168 49.0	12 59.6	128 48.8	16.0	67 44.1	42.5
21		219 01.5	181 37.2	·· 50.5	183 49.7	13 00.3	143 50.6	·· 16.1	82 46.3	·· 42.4
22		234 04.0	196 37.3	51.2	198 50.4	00.9	158 52.4	16.1	97 48.5	42.4
23		249 06.5	211 37.4	51.9	213 51.1	01.5	173 54.3	16.2	112 50.8	42.3
16 00		264 08.9	226 37.6	N11 52.6	228 51.8	N13 02.1	188 56.1	N22 16.3	127 53.0	N17 42.2
01		279 11.4	241 37.7	53.3	243 52.4	02.7	203 58.0	16.3	142 55.2	42.2
02		294 13.9	256 37.8	54.0	258 53.1	03.3	218 59.8	16.4	157 57.4	42.1
03		309 16.3	271 37.9	·· 54.7	273 53.8	·· 04.0	234 01.7	·· 16.4	172 59.6	·· 42.0
04		324 18.8	286 38.0	55.4	288 54.5	04.6	249 03.5	16.5	188 01.8	41.9
05		339 21.2	301 38.1	56.1	303 55.2	05.2	264 05.4	16.6	203 04.1	41.9
06		354 23.7	316 38.2	N11 56.8	318 55.9	N13 05.8	279 07.2	N22 16.6	218 06.3	N17 41.8
07		9 26.2	331 38.3	57.5	333 56.6	06.4	294 09.0	16.7	233 08.5	41.7
08	T	24 28.6	346 38.5	58.2	348 57.3	07.0	309 10.9	16.8	248 10.7	41.7
09	H	39 31.1	1 38.6	·· 58.9	3 57.9	·· 07.6	324 12.7	·· 16.8	263 12.9	·· 41.6
10	U	54 33.6	16 38.7	11 59.6	18 58.6	08.3	339 14.6	16.9	278 15.1	41.5
11	R	69 36.0	31 38.8	12 00.2	33 59.3	08.9	354 16.4	16.9	293 17.4	41.5
12	S	84 38.5	46 38.9	N12 00.9	49 00.0	N13 09.5	9 18.3	N22 17.0	308 19.6	N17 41.4
13	D	99 41.0	61 39.0	01.6	64 00.7	10.1	24 20.1	17.1	323 21.8	41.3
14	A	114 43.4	76 39.1	02.3	79 01.4	10.7	39 21.9	17.1	338 24.0	41.2
15	Y	129 45.9	91 39.2	·· 03.0	94 02.1	·· 11.3	54 23.8	·· 17.2	353 26.2	·· 41.2
16		144 48.4	106 39.3	03.7	109 02.7	11.9	69 25.6	17.2	8 28.4	41.1
17		159 50.8	121 39.4	04.4	124 03.4	12.6	84 27.5	17.3	23 30.6	41.0
18		174 53.3	136 39.5	N12 05.1	139 04.1	N13 13.2	99 29.3	N22 17.4	38 32.9	N17 41.0
19		189 55.7	151 39.6	05.8	154 04.8	13.8	114 31.2	17.4	53 35.1	40.9
20		204 58.2	166 39.7	06.5	169 05.5	14.4	129 33.0	17.5	68 37.3	40.8
21		220 00.7	181 39.8	·· 07.2	184 06.2	·· 15.0	144 34.9	·· 17.6	83 39.5	·· 40.7
22		235 03.1	196 39.9	07.9	199 06.8	15.6	159 36.7	17.6	98 41.7	40.7
23		250 05.6	211 40.0	08.6	214 07.5	16.2	174 38.5	17.7	113 43.9	40.6
17 00		265 08.1	226 40.1	N12 09.3	229 08.2	N13 16.8	189 40.4	N22 17.7	128 46.1	N17 40.5
01		280 10.5	241 40.2	10.0	244 08.9	17.4	204 42.2	17.8	143 48.4	40.5
02		295 13.0	256 40.3	10.7	259 09.6	18.1	219 44.1	17.9	158 50.6	40.4
03		310 15.5	271 40.4	·· 11.4	274 10.3	·· 18.7	234 45.9	·· 17.9	173 52.8	·· 40.3
04		325 17.9	286 40.4	12.1	289 11.0	19.3	249 47.8	18.0	188 55.0	40.2
05		340 20.4	301 40.5	12.8	304 11.6	19.9	264 49.6	18.0	203 57.2	40.2
06		355 22.8	316 40.6	N12 13.5	319 12.3	N13 20.5	279 51.5	N22 18.1	218 59.4	N17 40.1
07		10 25.3	331 40.7	14.2	334 13.0	21.1	294 53.3	18.2	234 01.6	40.0
08		25 27.8	346 40.8	14.8	349 13.7	21.7	309 55.1	18.2	249 03.8	40.0
09	F	40 30.2	1 40.9	·· 15.5	4 14.4	·· 22.3	324 57.0	·· 18.3	264 06.1	·· 39.9
10	R	55 32.7	16 41.0	16.2	19 15.1	22.9	339 58.8	18.3	279 08.3	39.8
11	I	70 35.2	31 41.1	16.9	34 15.8	23.5	355 00.7	18.4	294 10.5	39.7
12	D	85 37.6	46 41.2	N12 17.6	49 16.4	N13 24.1	10 02.5	N22 18.5	309 12.7	N17 39.7
13	A	100 40.1	61 41.2	18.3	64 17.1	24.8	25 04.4	18.5	324 14.9	39.6
14	Y	115 42.6	76 41.3	19.0	79 17.8	25.4	40 06.2	18.6	339 17.1	39.5
15		130 45.0	91 41.4	·· 19.7	94 18.5	·· 26.0	55 08.0	·· 18.6	354 19.3	·· 39.4
16		145 47.5	106 41.5	20.4	109 19.2	26.6	70 09.9	18.7	9 21.5	39.4
17		160 50.0	121 41.6	21.1	124 19.9	27.2	85 11.7	18.8	24 23.8	39.3
18		175 52.4	136 41.7	N12 21.8	139 20.5	N13 27.8	100 13.6	N22 18.8	39 26.0	N17 39.2
19		190 54.9	151 41.7	22.5	154 21.2	28.4	115 15.4	18.9	54 28.2	39.2
20		205 57.3	166 41.8	23.2	169 21.9	29.0	130 17.3	18.9	69 30.4	39.1
21		220 59.8	181 41.9	·· 23.9	184 22.6	·· 29.6	145 19.1	·· 19.0	84 32.6	·· 39.0
22		236 02.3	196 42.0	24.6	199 23.3	30.2	160 21.0	19.1	99 34.8	38.9
23		251 04.7	211 42.1	25.3	214 24.0	30.8	175 22.8	19.1	114 37.0	38.9
Mer. Pass.		h m 6 22.4	v 0.1	d 0.7	v 0.7	d 0.6	v 1.8	d 0.1	v 2.2	d 0.1

STARS		
Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 39.3	S40 23.6
Achernar	335 47.3	S57 20.8
Acrux	173 39.4	S62 58.8
Adhara	255 34.2	S28 56.7
Aldebaran	291 20.8	N16 27.7
Alioth	166 44.4	N56 05.2
Alkaid	153 20.0	N49 25.8
Al Na'ir	28 17.6	S47 03.9
Alnilam	276 14.2	S 1 13.1
Alphard	218 22.9	S 8 33.8
Alphecca	126 33.7	N26 47.6
Alpheratz	358 11.6	N28 57.8
Altair	62 34.4	N 8 48.6
Ankaa	353 42.6	S42 25.5
Antares	112 59.2	S26 22.9
Arcturus	146 20.3	N19 18.1
Atria	108 24.8	S68 59.2
Avior	234 29.5	S59 26.5
Bellatrix	279 01.4	N 6 19.7
Betelgeuse	271 31.0	N 7 24.1
Canopus	264 08.7	S52 41.2
Capella	281 15.0	N45 58.4
Deneb	49 49.6	N45 11.9
Denebola	183 01.3	N14 41.9
Diphda	349 23.2	S18 06.5
Dubhe	194 25.1	N61 52.6
Elnath	278 47.3	N28 35.2
Eltanin	90 58.2	N51 29.6
Enif	34 13.6	N 9 46.3
Fomalhaut	15 53.8	S29 44.3
Gacrux	172 30.9	S56 59.5
Gienah	176 20.2	S17 25.2
Hadar	149 26.0	S60 16.1
Hamal	328 31.6	N23 21.2
Kaus Aust.	84 19.4	S34 23.6
Kochab	137 18.2	N74 15.2
Markab	14 05.3	N15 05.0
Menkar	314 43.7	N 4 00.0
Menkent	148 39.3	S36 15.7
Miaplacidus	221 45.9	S69 37.8
Mirfak	309 19.6	N49 46.7
Nunki	76 31.5	S26 19.4
Peacock	54 01.4	S56 48.2
Pollux	244 01.2	N28 04.8
Procyon	245 28.4	N 5 16.9
Rasalhague	96 31.3	N12 34.7
Regulus	208 12.5	N12 04.6
Rigel	281 38.5	S 8 13.8
Rigil Kent.	140 28.2	S60 44.7
Sabik	102 43.3	S15 41.8
Schedar	350 11.5	N56 24.6
Shaula	96 58.3	S37 05.2
Sirius	258 58.0	S16 41.3
Spica	158 59.7	S11 02.7
Suhail	223 12.6	S43 20.8
Vega	80 56.9	N38 45.8
Zuben'ubi	137 35.2	S15 56.9

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	322 28.6	8 53
Mars	324 42.8	8 44
Jupiter	284 47.2	11 23
Saturn	223 44.1	15 26

G.M.T.		SUN G.H.A.	SUN Dec.	MOON G.H.A.	MOON *v*	MOON Dec.	MOON *d*	MOON H.P.
d	h	° ′	° ′	° ′	′	° ′	′	′
15	00	179 56.0	N23 17.6	199 57.9	12.7	N17 42.5	3.3	54.0
	01	194 55.8	17.7	214 29.6	12.6	17 45.8	3.3	54.0
	02	209 55.7	17.8	229 01.2	12.6	17 49.1	3.2	54.0
	03	224 55.6	·· 17.9	243 32.8	12.5	17 52.3	3.1	54.0
	04	239 55.4	18.0	258 04.3	12.6	17 55.4	3.0	54.0
	05	254 55.3	18.2	272 35.9	12.5	17 58.4	3.0	54.0
	06	269 55.2	N23 18.3	287 07.4	12.5	N18 01.4	2.8	54.0
WEDNESDAY	07	284 55.0	18.4	301 38.9	12.5	18 04.2	2.8	54.0
	08	299 54.9	18.5	316 10.4	12.5	18 07.0	2.7	54.0
	09	314 54.8	·· 18.6	330 41.9	12.4	18 09.7	2.6	54.0
	10	329 54.6	18.7	345 13.3	12.5	18 12.3	2.5	54.0
	11	344 54.5	18.8	359 44.8	12.4	18 14.8	2.5	54.0
	12	359 54.4	N23 18.9	14 16.2	12.4	N18 17.3	2.4	54.0
	13	14 54.2	19.0	28 47.6	12.3	18 19.7	2.2	54.0
	14	29 54.1	19.1	43 18.9	12.4	18 21.9	2.2	54.0
	15	44 54.0	·· 19.2	57 50.3	12.3	18 24.1	2.2	54.0
	16	59 53.8	19.3	72 21.6	12.4	18 26.3	2.0	54.0
	17	74 53.7	19.4	86 53.0	12.3	18 28.3	1.9	54.0
	18	89 53.6	N23 19.5	101 24.3	12.3	N18 30.2	1.9	54.0
	19	104 53.4	19.6	115 55.6	12.2	18 32.1	1.8	54.0
	20	119 53.3	19.7	130 26.8	12.3	18 33.9	1.7	54.0
	21	134 53.1	·· 19.8	144 58.1	12.2	18 35.6	1.6	54.0
	22	149 53.0	19.9	159 29.3	12.3	18 37.2	1.5	54.0
	23	164 52.9	20.0	174 00.6	12.2	18 38.7	1.5	54.0
16	00	179 52.7	N23 20.1	188 31.8	12.2	N18 40.2	1.3	54.0
	01	194 52.6	20.2	203 03.0	12.2	18 41.5	1.3	54.0
	02	209 52.5	20.3	217 34.2	12.1	18 42.8	1.2	54.0
	03	224 52.3	·· 20.4	232 05.3	12.2	18 44.0	1.1	54.0
	04	239 52.2	20.5	246 36.5	12.1	18 45.1	1.0	54.0
	05	254 52.1	20.5	261 07.6	12.2	18 46.1	0.9	54.0
	06	269 51.9	N23 20.6	275 38.8	12.1	N18 47.0	0.8	54.0
	07	284 51.8	20.7	290 09.9	12.1	18 47.8	0.8	54.1
THURSDAY	08	299 51.7	20.8	304 41.0	12.1	18 48.6	0.7	54.1
	09	314 51.5	·· 20.9	319 12.1	12.1	18 49.3	0.5	54.1
	10	329 51.4	21.0	333 43.2	12.1	18 49.8	0.5	54.1
	11	344 51.3	21.1	348 14.3	12.0	18 50.3	0.4	54.1
	12	359 51.1	N23 21.2	2 45.3	12.1	N18 50.7	0.4	54.1
	13	14 51.0	21.3	17 16.4	12.0	18 51.1	0.2	54.1
	14	29 50.8	21.3	31 47.4	12.1	18 51.3	0.1	54.1
	15	44 50.7	·· 21.4	46 18.5	12.0	18 51.4	0.1	54.1
	16	59 50.6	21.5	60 49.5	12.0	18 51.5	0.1	54.1
	17	74 50.4	21.6	75 20.5	12.0	18 51.4	0.1	54.1
	18	89 50.3	N23 21.7	89 51.5	12.0	N18 51.3	0.2	54.1
	19	104 50.2	21.8	104 22.5	12.0	18 51.1	0.3	54.1
	20	119 50.0	21.8	118 53.5	12.0	18 50.8	0.4	54.1
	21	134 49.9	·· 21.9	133 24.5	12.0	18 50.4	0.4	54.1
	22	149 49.8	22.0	147 55.5	12.0	18 50.0	0.6	54.2
	23	164 49.6	22.1	162 26.5	12.0	18 49.4	0.6	54.2
17	00	179 49.5	N23 22.2	176 57.5	11.9	N18 48.8	0.8	54.2
	01	194 49.3	22.2	191 28.4	12.0	18 48.0	0.8	54.2
	02	209 49.2	22.3	205 59.4	11.9	18 47.2	0.9	54.2
	03	224 49.1	·· 22.4	220 30.3	12.0	18 46.3	1.0	54.2
	04	239 48.9	22.5	235 01.3	12.0	18 45.3	1.1	54.2
	05	254 48.8	22.5	249 32.3	11.9	18 44.2	1.2	54.2
	06	269 48.7	N23 22.6	264 03.2	12.0	N18 43.0	1.2	54.2
	07	284 48.5	22.7	278 34.2	11.9	18 41.8	1.4	54.2
	08	299 48.4	22.8	293 05.1	12.0	18 40.4	1.4	54.2
FRIDAY	09	314 48.3	·· 22.8	307 36.1	11.9	18 39.0	1.5	54.2
	10	329 48.1	22.9	322 07.0	12.0	18 37.5	1.7	54.3
	11	344 48.0	23.0	336 38.0	11.9	18 35.8	1.7	54.3
	12	359 47.8	N23 23.0	351 08.9	11.9	N18 34.1	1.7	54.3
	13	14 47.7	23.1	5 39.8	12.0	18 32.4	1.9	54.3
	14	29 47.6	23.2	20 10.8	11.9	18 30.5	2.0	54.3
	15	44 47.4	·· 23.2	34 41.7	12.0	18 28.5	2.0	54.3
	16	59 47.3	23.3	49 12.7	11.9	18 26.5	2.2	54.3
	17	74 47.2	23.4	63 43.6	12.0	18 24.3	2.2	54.3
	18	89 47.0	N23 23.4	78 14.6	11.9	N18 22.1	2.3	54.3
	19	104 46.9	23.5	92 45.5	12.0	18 19.8	2.4	54.3
	20	119 46.8	23.6	107 16.5	12.0	18 17.4	2.5	54.4
	21	134 46.6	·· 23.6	121 47.5	11.9	18 14.9	2.6	54.4
	22	149 46.5	23.7	136 18.4	12.0	18 12.3	2.6	54.4
	23	164 46.3	23.7	150 49.4	12.0	18 09.7	2.8	54.4
		S.D. 15.8	*d* 0.1	S.D.	14.7	14.7		14.8

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 15	Moonrise 16	Moonrise 17	Moonrise 18
°	h m	h m	h m	h m	h m	h m	h m
N 72	☐	☐	☐	☐	☐	☐	01 16
N 70	☐	☐	☐	00 37	00 57	01 42	02 55
68	☐	☐	☐	01 14	01 43	02 30	03 34
66	☐	☐	☐	01 40	02 13	03 00	04 02
64	////	////	01 32	02 00	02 36	03 23	04 22
62	////	////	02 10	02 16	02 54	03 42	04 39
60	////	00 52	02 36	02 30	03 09	03 57	04 53
N 58	////	01 41	02 56	02 42	03 22	04 09	05 05
56	////	02 11	03 13	02 52	03 33	04 21	05 16
54	00 48	02 33	03 27	03 01	03 42	04 30	05 25
52	01 33	02 51	03 39	03 09	03 51	04 39	05 33
50	02 00	03 06	03 50	03 16	03 59	04 47	05 40
45	02 46	03 35	04 13	03 32	04 15	05 03	05 56
N 40	03 16	03 58	04 30	03 45	04 29	05 17	06 09
35	03 39	04 16	04 46	03 56	04 40	05 28	06 19
30	03 58	04 31	04 58	04 05	04 50	05 38	06 29
20	04 27	04 56	05 20	04 22	05 08	05 56	06 45
N 10	04 49	05 16	05 39	04 36	05 23	06 11	07 00
0	05 08	05 34	05 57	04 50	05 37	06 25	07 13
S 10	05 25	05 51	06 14	05 03	05 51	06 39	07 26
20	05 41	06 09	06 33	05 18	06 06	06 54	07 41
30	05 58	06 28	06 54	05 34	06 24	07 12	07 57
35	06 06	06 38	07 06	05 44	06 34	07 22	08 06
40	06 16	06 50	07 20	05 55	06 46	07 33	08 17
45	06 26	07 03	07 37	06 08	06 59	07 47	08 30
S 50	06 38	07 19	07 58	06 24	07 16	08 03	08 45
52	06 43	07 27	08 08	06 32	07 24	08 11	08 53
54	06 49	07 35	08 19	06 40	07 33	08 20	09 01
56	06 55	07 44	08 31	06 49	07 43	08 30	09 10
58	07 02	07 54	08 46	07 00	07 54	08 41	09 20
S 60	07 09	08 06	09 03	07 12	08 07	08 53	09 31

Lat.	Sunset	Twilight Civil	Twilight Naut.	Moonset 15	Moonset 16	Moonset 17	Moonset 18
°	h m	h m	h m	h m	h m	h m	h m
N 72	☐	☐	☐	☐	☐	☐	00 50
N 70	☐	☐	☐	21 50	22 45	23 12	23 23
68	☐	☐	☐	21 04	21 57	22 32	22 53
66	☐	☐	☐	20 34	21 26	22 04	22 30
64	22 30	////	////	20 12	21 03	21 43	22 13
62	21 52	////	////	19 54	20 45	21 26	21 58
60	21 26	23 11	////	19 39	20 29	21 11	21 46
N 58	21 05	22 21	////	19 26	20 17	20 59	21 35
56	20 49	21 51	////	19 15	20 05	20 49	21 26
54	20 34	21 29	23 15	19 06	19 56	20 39	21 17
52	20 22	21 11	22 29	18 57	19 47	20 31	21 10
50	20 11	20 56	22 01	18 50	19 39	20 24	21 03
45	19 49	20 26	21 16	18 33	19 22	20 08	20 49
N 40	19 31	20 04	20 45	18 20	19 09	19 55	20 37
35	19 16	19 45	20 22	18 08	18 57	19 43	20 27
30	19 03	19 30	20 04	17 58	18 47	19 34	20 18
20	18 41	19 05	19 35	17 41	18 30	19 17	20 02
N 10	18 22	18 45	19 12	17 26	18 14	19 02	19 49
0	18 04	18 27	18 53	17 12	18 00	18 48	19 36
S 10	17 47	18 10	18 36	16 59	17 46	18 34	19 23
20	17 28	17 52	18 20	16 44	17 31	18 19	19 10
30	17 07	17 34	18 03	16 27	17 13	18 02	18 54
35	16 55	17 23	17 55	16 17	17 03	17 53	18 45
40	16 41	17 11	17 45	16 05	16 51	17 41	18 34
45	16 24	16 58	17 35	15 52	16 37	17 28	18 22
S 50	16 03	16 42	17 23	15 36	16 21	17 11	18 07
52	15 53	16 34	17 18	15 28	16 13	17 04	18 00
54	15 42	16 26	17 12	15 19	16 04	16 55	17 52
56	15 30	16 17	17 06	15 10	15 54	16 46	17 44
58	15 15	16 07	16 59	14 59	15 43	16 35	17 34
S 60	14 58	15 55	16 52	14 47	15 30	16 22	17 22

Day	SUN Eqn. of Time 00ʰ	SUN Eqn. of Time 12ʰ	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
	m s	m s	h m	h m	h m	d	
15	00 16	00 22	12 00	11 01	23 25	28	●
16	00 29	00 35	12 01	11 49	24 13	29	
17	00 42	00 48	12 01	12 37	00 13	01	

1977 JUNE 18, 19, 20 (SAT., SUN., MON.)

	G.M.T.	ARIES	VENUS −3.9		MARS +1.3		JUPITER −1.5		SATURN +0.6	
		G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
	d h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
	18 00	266 07.2	226 42.1	N12 26.0	229 24.7	N13 31.4	190 24.6	N22 19.2	129 39.2	N17 38.8
	01	281 09.7	241 42.2	26.7	244 25.3	32.0	205 26.5	19.2	144 41.4	38.7
	02	296 12.1	256 42.3	27.4	259 26.0	32.6	220 28.3	19.3	159 43.7	38.7
	03	311 14.6	271 42.4	·· 28.1	274 26.7	·· 33.2	235 30.2	·· 19.4	174 45.9	·· 38.6
	04	326 17.1	286 42.4	28.8	289 27.4	33.8	250 32.0	19.4	189 48.1	38.5
	05	341 19.5	301 42.5	29.5	304 28.1	34.4	265 33.9	19.5	204 50.3	38.4
	06	356 22.0	316 42.6	N12 30.2	319 28.8	N13 35.0	280 35.7	N22 19.5	219 52.5	N17 38.4
	07	11 24.5	331 42.6	30.9	334 29.4	35.6	295 37.6	19.6	234 54.7	38.3
S	08	26 26.9	346 42.7	31.6	349 30.1	36.3	310 39.4	19.7	249 56.9	38.2
A	09	41 29.4	1 42.8	·· 32.2	4 30.8	·· 36.9	325 41.3	·· 19.7	264 59.1	·· 38.1
T	10	56 31.8	16 42.9	32.9	19 31.5	37.5	340 43.1	19.8	280 01.3	38.1
U	11	71 34.3	31 42.9	33.6	34 32.2	38.1	355 44.9	19.8	295 03.6	38.0
R	12	86 36.8	46 43.0	N12 34.3	49 32.9	N13 38.7	10 46.8	N22 19.9	310 05.8	N17 37.9
D	13	101 39.2	61 43.1	35.0	64 33.5	39.3	25 48.6	20.0	325 08.0	37.9
A	14	116 41.7	76 43.1	35.7	79 34.2	39.9	40 50.5	20.0	340 10.2	37.8
Y	15	131 44.2	91 43.2	·· 36.4	94 34.9	·· 40.5	55 52.3	·· 20.1	355 12.4	·· 37.7
	16	146 46.6	106 43.3	37.1	109 35.6	41.1	70 54.2	20.1	10 14.6	37.6
	17	161 49.1	121 43.3	37.8	124 36.3	41.7	85 56.0	20.2	25 16.8	37.6
	18	176 51.6	136 43.4	N12 38.5	139 37.0	N13 42.3	100 57.9	N22 20.3	40 19.0	N17 37.5
	19	191 54.0	151 43.4	39.2	154 37.6	42.9	115 59.7	20.3	55 21.2	37.4
	20	206 56.5	166 43.5	39.9	169 38.3	43.5	131 01.5	20.4	70 23.4	37.3
	21	221 58.9	181 43.6	·· 40.6	184 39.0	·· 44.1	146 03.4	·· 20.4	85 25.7	·· 37.3
	22	237 01.4	196 43.6	41.3	199 39.7	44.7	161 05.2	20.5	100 27.9	37.2
	23	252 03.9	211 43.7	42.0	214 40.4	45.3	176 07.1	20.5	115 30.1	37.1
	19 00	267 06.3	226 43.7	N12 42.7	229 41.1	N13 45.9	191 08.9	N22 20.6	130 32.3	N17 37.1
	01	282 08.8	241 43.8	43.4	244 41.7	46.5	206 10.8	20.7	145 34.5	37.0
	02	297 11.3	256 43.9	44.1	259 42.4	47.1	221 12.6	20.7	160 36.7	36.9
	03	312 13.7	271 43.9	·· 44.8	274 43.1	·· 47.7	236 14.5	·· 20.8	175 38.9	·· 36.8
	04	327 16.2	286 44.0	45.5	289 43.8	48.3	251 16.3	20.8	190 41.1	36.8
	05	342 18.7	301 44.0	46.2	304 44.5	48.9	266 18.2	20.9	205 43.3	36.7
	06	357 21.1	316 44.1	N12 46.9	319 45.2	N13 49.5	281 20.0	N22 21.0	220 45.5	N17 36.6
	07	12 23.6	331 44.1	47.6	334 45.8	50.1	296 21.8	21.0	235 47.7	36.5
	08	27 26.1	346 44.2	48.3	349 46.5	50.6	311 23.7	21.1	250 49.9	36.5
S	09	42 28.5	1 44.2	·· 49.0	4 47.2	·· 51.2	326 25.5	·· 21.1	265 52.2	·· 36.4
U	10	57 31.0	16 44.3	49.7	19 47.9	51.8	341 27.4	21.2	280 54.4	36.3
N	11	72 33.4	31 44.3	50.4	34 48.6	52.4	356 29.2	21.2	295 56.6	36.2
D	12	87 35.9	46 44.4	N12 51.1	49 49.3	N13 53.0	11 31.1	N22 21.3	310 58.8	N17 36.2
A	13	102 38.4	61 44.4	51.8	64 49.9	53.6	26 32.9	21.4	326 01.0	36.1
Y	14	117 40.8	76 44.5	52.4	79 50.6	54.2	41 34.8	21.4	341 03.2	36.0
	15	132 43.3	91 44.5	·· 53.1	94 51.3	·· 54.8	56 36.6	·· 21.5	356 05.4	·· 36.0
	16	147 45.8	106 44.6	53.8	109 52.0	55.4	71 38.5	21.5	11 07.6	35.9
	17	162 48.2	121 44.6	54.5	124 52.7	56.0	86 40.3	21.6	26 09.8	35.8
	18	177 50.7	136 44.7	N12 55.2	139 53.3	N13 56.6	101 42.1	N22 21.7	41 12.0	N17 35.7
	19	192 53.2	151 44.7	55.9	154 54.0	57.2	116 44.0	21.7	56 14.2	35.7
	20	207 55.6	166 44.7	56.6	169 54.7	57.8	131 45.8	21.8	71 16.4	35.6
	21	222 58.1	181 44.8	·· 57.3	184 55.4	·· 58.4	146 47.7	·· 21.8	86 18.6	·· 35.5
	22	238 00.6	196 44.8	58.0	199 56.1	59.0	161 49.5	21.9	101 20.8	35.4
	23	253 03.0	211 44.9	58.7	214 56.8	13 59.6	176 51.4	21.9	116 23.1	35.4
	20 00	268 05.5	226 44.9	N12 59.4	229 57.4	N14 00.2	191 53.2	N22 22.0	131 25.3	N17 35.3
	01	283 07.9	241 44.9	13 00.1	244 58.1	00.8	206 55.1	22.1	146 27.5	35.2
	02	298 10.4	256 45.0	00.8	259 58.8	01.4	221 56.9	22.1	161 29.7	35.1
	03	313 12.9	271 45.0	·· 01.5	274 59.5	·· 01.9	236 58.8	·· 22.2	176 31.9	·· 35.1
	04	328 15.3	286 45.1	02.2	290 00.2	02.5	252 00.6	22.2	191 34.1	35.0
	05	343 17.8	301 45.1	02.9	305 00.8	03.1	267 02.4	22.3	206 36.3	34.9
	06	358 20.3	316 45.1	N13 03.6	320 01.5	N14 03.7	282 04.3	N22 22.3	221 38.5	N17 34.8
	07	13 22.7	331 45.2	04.3	335 02.2	04.3	297 06.1	22.4	236 40.7	34.8
	08	28 25.2	346 45.2	05.0	350 02.9	04.9	312 08.0	22.5	251 42.9	34.7
M	09	43 27.7	1 45.2	·· 05.7	5 03.6	·· 05.5	327 09.8	·· 22.5	266 45.1	·· 34.6
O	10	58 30.1	16 45.3	06.4	20 04.3	06.1	342 11.7	22.6	281 47.3	34.6
N	11	73 32.6	31 45.3	07.1	35 04.9	06.7	357 13.5	22.6	296 49.5	34.5
D	12	88 35.0	46 45.3	N13 07.8	50 05.6	N14 07.3	12 15.4	N22 22.7	311 51.7	N17 34.4
A	13	103 37.5	61 45.4	08.5	65 06.3	07.9	27 17.2	22.7	326 53.9	34.3
Y	14	118 40.0	76 45.4	09.2	80 07.0	08.4	42 19.1	22.8	341 56.1	34.3
	15	133 42.4	91 45.4	·· 09.9	95 07.7	·· 09.0	57 20.9	·· 22.9	356 58.4	·· 34.2
	16	148 44.9	106 45.4	10.6	110 08.3	09.6	72 22.8	22.9	12 00.6	34.1
	17	163 47.4	121 45.5	11.2	125 09.0	10.2	87 24.6	23.0	27 02.8	34.0
	18	178 49.8	136 45.5	N13 11.9	140 09.7	N14 10.8	102 26.4	N22 23.0	42 05.0	N17 34.0
	19	193 52.3	151 45.5	12.6	155 10.4	11.4	117 28.3	23.1	57 07.2	33.9
	20	208 54.8	166 45.5	13.3	170 11.1	12.0	132 30.1	23.1	72 09.4	33.8
	21	223 57.2	181 45.6	·· 14.0	185 11.8	·· 12.6	147 32.0	·· 23.2	87 11.6	·· 33.7
	22	238 59.7	196 45.6	14.7	200 12.4	13.1	162 33.8	23.3	102 13.8	33.7
	23	254 02.2	211 45.6	15.4	215 13.1	13.7	177 35.7	23.3	117 16.0	33.6
	Mer. Pass.	h m 6 10.6	*v* 0.0	*d* 0.7	*v* 0.7	*d* 0.6	*v* 1.8	*d* 0.1	*v* 2.2	*d* 0.1

STARS		
Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 39.3	S40 23.6
Achernar	335 47.3	S57 20.8
Acrux	173 39.4	S62 58.8
Adhara	255 34.2	S28 56.6
Aldebaran	291 20.8	N16 27.7
Alioth	166 44.4	N56 05.2
Alkaid	153 20.0	N49 25.8
Al Na'ir	28 17.5	S47 03.9
Alnilam	276 14.2	S 1 13.1
Alphard	218 22.9	S 8 33.8
Alphecca	126 33.7	N26 47.6
Alpheratz	358 11.6	N28 57.8
Altair	62 34.4	N 8 48.6
Ankaa	353 42.5	S42 25.4
Antares	112 59.2	S26 22.9
Arcturus	146 20.3	N19 18.1
Atria	108 24.8	S68 59.3
Avior	234 29.6	S59 26.5
Bellatrix	279 01.4	N 6 19.7
Betelgeuse	271 31.0	N 7 24.1
Canopus	264 08.7	S52 41.2
Capella	281 15.0	N45 58.4
Deneb	49 49.5	N45 11.9
Denebola	183 01.3	N14 41.9
Diphda	349 23.2	S18 06.5
Dubhe	194 25.1	N61 52.6
Elnath	278 47.3	N28 35.2
Eltanin	90 58.2	N51 29.6
Enif	34 13.5	N 9 46.3
Fomalhaut	15 53.8	S29 44.3
Gacrux	172 31.0	S56 59.5
Gienah	176 20.2	S17 25.2
Hadar	149 26.0	S60 16.1
Hamal	328 31.6	N23 21.2
Kaus Aust.	84 19.3	S34 23.6
Kochab	137 18.2	N74 15.2
Markab	14 05.2	N15 05.0
Menkar	314 43.7	N 4 00.0
Menkent	148 39.3	S36 15.7
Miaplacidus	221 45.9	S69 37.8
Mirfak	309 19.6	N49 46.7
Nunki	76 31.5	S26 19.4
Peacock	54 01.4	S56 48.2
Pollux	244 01.2	N28 04.8
Procyon	245 28.4	N 5 16.9
Rasalhague	96 31.3	N12 34.7
Regulus	208 12.5	N12 04.6
Rigel	281 38.5	S 8 13.7
Rigil Kent.	140 28.2	S60 44.7
Sabik	102 43.3	S15 41.8
Schedar	350 11.5	N56 24.6
Shaula	96 58.3	S37 05.2
Sirius	258 58.0	S16 41.3
Spica	158 59.7	S11 02.7
Suhail	223 12.6	S43 20.8
Vega	80 56.9	N38 45.8
Zuben'ubi	137 35.2	S15 56.9

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	319 37.4	8 53
Mars	322 34.7	8 41
Jupiter	284 02.6	11 14
Saturn	223 25.9	15 16

G.M.T.	SUN G.H.A.	SUN Dec.	MOON G.H.A.	MOON v	MOON Dec.	MOON d	MOON H.P.
d h	° ′	° ′	° ′	′	° ′	′	′
18 00	179 46.2	N23 23.8	165 20.4	11.9	N18 06.9	2.8	54.4
01	194 46.1	23.9	179 51.3	12.0	18 04.1	2.9	54.4
02	209 45.9	23.9	194 22.3	12.0	18 01.2	3.0	54.4
03	224 45.8	· · 24.0	208 53.3	12.0	17 58.2	3.1	54.4
04	239 45.7	24.0	223 24.3	12.0	17 55.1	3.2	54.4
05	254 45.5	24.1	237 55.3	12.0	17 51.9	3.2	54.5
06	269 45.4	N23 24.2	252 26.3	12.0	N17 48.7	3.3	54.5
07	284 45.3	24.2	266 57.3	12.0	17 45.4	3.5	54.5
S 08	299 45.1	24.3	281 28.3	12.1	17 41.9	3.5	54.5
A 09	314 45.0	· · 24.3	295 59.4	12.0	17 38.4	3.6	54.5
T 10	329 44.8	24.4	310 30.4	12.1	17 34.8	3.6	54.5
U 11	344 44.7	24.4	325 01.5	12.0	17 31.2	3.8	54.5
R 12	359 44.6	N23 24.5	339 32.5	12.1	N17 27.4	3.9	54.5
D 13	14 44.4	24.5	354 03.6	12.0	17 23.5	3.9	54.6
A 14	29 44.3	24.6	8 34.6	12.1	17 19.6	4.0	54.6
Y 15	44 44.2	· · 24.6	23 05.7	12.1	17 15.6	4.1	54.6
16	59 44.0	24.7	37 36.8	12.1	17 11.5	4.2	54.6
17	74 43.9	24.7	52 07.9	12.1	17 07.3	4.2	54.6
18	89 43.7	N23 24.8	66 39.0	12.1	N17 03.1	4.3	54.6
19	104 43.6	24.8	81 10.1	12.1	16 58.8	4.5	54.6
20	119 43.5	24.9	95 41.2	12.2	16 54.3	4.5	54.7
21	134 43.3	· · 24.9	110 12.4	12.1	16 49.8	4.6	54.7
22	149 43.2	25.0	124 43.5	12.1	16 45.2	4.6	54.7
23	164 43.1	25.0	139 14.6	12.2	16 40.6	4.8	54.7
19 00	179 42.9	N23 25.1	153 45.8	12.2	N16 35.8	4.8	54.7
01	194 42.8	25.1	168 17.0	12.2	16 31.0	4.9	54.7
02	209 42.6	25.1	182 48.2	12.2	16 26.1	5.0	54.7
03	224 42.5	· · 25.2	197 19.4	12.2	16 21.1	5.0	54.8
04	239 42.4	25.2	211 50.6	12.2	16 16.1	5.2	54.8
05	254 42.2	25.3	226 21.8	12.2	16 10.9	5.2	54.8
06	269 42.1	N23 25.3	240 53.0	12.3	N16 05.7	5.3	54.8
07	284 42.0	25.3	255 24.3	12.2	16 00.4	5.3	54.8
08	299 41.8	25.4	269 55.5	12.3	15 55.1	5.5	54.8
S 09	314 41.7	· · 25.4	284 26.8	12.3	15 49.6	5.5	54.9
U 10	329 41.6	25.4	298 58.1	12.3	15 44.1	5.6	54.9
N 11	344 41.4	25.5	313 29.4	12.3	15 38.5	5.7	54.9
D 12	359 41.3	N23 25.5	328 00.7	12.3	N15 32.8	5.8	54.9
A 13	14 41.1	25.6	342 32.0	12.3	15 27.0	5.8	54.9
Y 14	29 41.0	25.6	357 03.3	12.4	15 21.2	5.9	54.9
15	44 40.9	· · 25.6	11 34.7	12.3	15 15.3	6.0	55.0
16	59 40.7	25.7	26 06.0	12.4	15 09.3	6.0	55.0
17	74 40.6	25.7	40 37.4	12.4	15 03.3	6.1	55.0
18	89 40.5	N23 25.7	55 08.8	12.3	N14 57.2	6.2	55.0
19	104 40.3	25.7	69 40.1	12.4	14 51.0	6.3	55.0
20	119 40.2	25.8	84 11.5	12.5	14 44.7	6.4	55.0
21	134 40.0	· · 25.8	98 43.0	12.4	14 38.3	6.4	55.1
22	149 39.9	25.8	113 14.4	12.4	14 31.9	6.5	55.1
23	164 39.8	25.9	127 45.8	12.5	14 25.4	6.5	55.1
20 00	179 39.6	N23 25.9	142 17.3	12.4	N14 18.9	6.7	55.1
01	194 39.5	25.9	156 48.7	12.5	14 12.2	6.7	55.1
02	209 39.4	25.9	171 20.2	12.5	14 05.5	6.7	55.2
03	224 39.2	· · 26.0	185 51.7	12.5	13 58.8	6.9	55.2
04	239 39.1	26.0	200 23.2	12.5	13 51.9	6.9	55.2
05	254 38.9	26.0	214 54.7	12.5	13 45.0	6.9	55.2
06	269 38.8	N23 26.0	229 26.2	12.6	N13 38.1	7.1	55.2
07	284 38.7	26.0	243 57.8	12.5	13 31.0	7.1	55.2
08	299 38.5	26.1	258 29.3	12.6	13 23.9	7.2	55.3
M 09	314 38.4	· · 26.1	273 00.9	12.5	13 16.7	7.2	55.3
O 10	329 38.3	26.1	287 32.4	12.6	13 09.5	7.3	55.3
N 11	344 38.1	26.1	302 04.0	12.6	13 02.2	7.4	55.3
D 12	359 38.0	N23 26.1	316 35.6	12.6	N12 54.8	7.4	55.3
A 13	14 37.9	26.2	331 07.2	12.6	12 47.4	7.6	55.4
Y 14	29 37.7	26.2	345 38.8	12.6	12 39.8	7.5	55.4
15	44 37.6	· · 26.2	0 10.4	12.6	12 32.3	7.7	55.4
16	59 37.4	26.2	14 42.0	12.7	12 24.6	7.6	55.4
17	74 37.3	26.2	29 13.7	12.6	12 17.0	7.8	55.4
18	89 37.2	N23 26.2	43 45.3	12.7	N12 09.2	7.8	55.5
19	104 37.0	26.2	58 17.0	12.6	12 01.4	7.9	55.5
20	119 36.9	26.3	72 48.6	12.7	11 53.5	7.9	55.5
21	134 36.8	· · 26.3	87 20.3	12.7	11 45.6	8.0	55.5
22	149 36.6	26.3	101 52.0	12.7	11 37.6	8.1	55.6
23	164 36.5	26.3	116 23.7	12.7	11 29.5	8.1	55.6
	S.D. 15.8	d 0.0	S.D. 14.9		15.0		15.1

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 18	Moonrise 19	Moonrise 20	Moonrise 21
°	h m	h m	h m	h m	h m	h m	h m
N 72	▭	▭	▭	01 16	03 38	05 29	07 15
N 70	▭	▭	▭	02 55	04 23	05 57	07 32
68	▭	▭	▭	03 34	04 52	06 17	07 46
66	▭	▭	▭	04 02	05 14	06 33	07 57
64	////	////	01 31	04 22	05 31	06 46	08 06
62	////	////	02 09	04 39	05 45	06 58	08 14
60	////	00 49	02 35	04 53	05 57	07 07	08 20
N 58	////	01 40	02 56	05 05	06 08	07 15	08 26
56	////	02 10	03 13	05 16	06 17	07 22	08 32
54	00 45	02 32	03 27	05 25	06 25	07 29	08 36
52	01 32	02 50	03 39	05 33	06 32	07 35	08 40
50	02 00	03 06	03 50	05 40	06 38	07 40	08 44
45	02 46	03 35	04 13	05 56	06 52	07 51	08 53
N 40	03 16	03 58	04 31	06 09	07 03	08 01	08 59
35	03 39	04 16	04 46	06 19	07 13	08 08	09 05
30	03 58	04 31	04 59	06 29	07 21	08 15	09 11
20	04 27	04 56	05 21	06 45	07 36	08 28	09 20
N 10	04 50	05 17	05 40	07 00	07 49	08 38	09 27
0	05 09	05 35	05 58	07 13	08 01	08 48	09 35
S 10	05 26	05 52	06 15	07 26	08 13	08 58	09 42
20	05 42	06 10	06 34	07 41	08 25	09 08	09 50
30	05 59	06 28	06 55	07 57	08 40	09 20	09 59
35	06 07	06 39	07 07	08 06	08 48	09 27	10 04
40	06 17	06 51	07 21	08 17	08 58	09 35	10 10
45	06 27	07 04	07 38	08 30	09 09	09 44	10 17
S 50	06 39	07 20	07 59	08 45	09 22	09 55	10 25
52	06 44	07 28	08 09	08 53	09 29	10 00	10 28
54	06 50	07 36	08 20	09 01	09 36	10 06	10 32
56	06 56	07 45	08 33	09 10	09 43	10 12	10 37
58	07 03	07 56	08 47	09 20	09 52	10 19	10 42
S 60	07 10	08 07	09 05	09 31	10 02	10 27	10 47

Lat.	Sunset	Twilight Civil	Twilight Naut.	Moonset 18	Moonset 19	Moonset 20	Moonset 21
°	h m	h m	h m	h m	h m	h m	h m
N 72	▭	▭	▭	00 50	00 08 23 56	23 47	23 40
N 70	▭	▭	▭	23 23	23 27	23 29	23 29
68	▭	▭	▭	22 53	23 06	23 14	23 20
66	▭	▭	▭	22 30	22 49	23 02	23 12
64	22 32	////	////	22 13	22 35	22 52	23 05
62	21 54	////	////	21 58	22 23	22 43	23 00
60	21 27	23 14	////	21 46	22 13	22 36	22 55
N 58	21 07	22 23	////	21 35	22 04	22 29	22 51
56	20 50	21 53	////	21 26	21 57	22 23	22 47
54	20 36	21 30	23 18	21 17	21 50	22 18	22 43
52	20 23	21 12	22 31	21 10	21 43	22 13	22 40
50	20 12	20 57	22 03	21 03	21 38	22 09	22 37
45	19 50	20 27	21 17	20 49	21 26	21 59	22 31
N 40	19 32	20 05	20 46	20 37	21 16	21 52	22 25
35	19 17	19 46	20 23	20 27	21 07	21 45	22 21
30	19 04	19 31	20 04	20 18	20 59	21 39	22 17
20	18 42	19 06	19 35	20 02	20 46	21 28	22 09
N 10	18 23	18 46	19 13	19 49	20 34	21 19	22 03
0	18 05	18 27	18 54	19 36	20 24	21 11	21 57
S 10	17 47	18 10	18 37	19 23	20 13	21 02	21 51
20	17 29	17 53	18 20	19 10	20 01	20 53	21 45
30	17 08	17 34	18 04	18 54	19 47	20 42	21 37
35	16 55	17 23	17 55	18 45	19 39	20 36	21 33
40	16 41	17 12	17 46	18 34	19 31	20 29	21 28
45	16 24	16 58	17 35	18 22	19 20	20 20	21 23
S 50	16 03	16 42	17 24	18 07	19 07	20 10	21 16
52	15 54	16 35	17 18	18 00	19 01	20 06	21 13
54	15 42	16 26	17 13	17 52	18 55	20 01	21 09
56	15 30	16 17	17 06	17 44	18 47	19 55	21 05
58	15 15	16 07	17 00	17 34	18 39	19 49	21 01
S 60	14 57	15 55	16 52	17 22	18 30	19 41	20 56

Day	SUN Eqn. of Time 00ʰ	SUN Eqn. of Time 12ʰ	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
	m s	m s	h m	h m	h m	d	
18	00 55	01 01	12 01	13 25	01 01	02	
19	01 08	01 15	12 01	14 12	01 48	03	◐
20	01 21	01 28	12 01	14 59	02 36	04	

1977 JUNE 21, 22, 23 (TUES., WED., THURS.)

G.M.T.	ARIES	VENUS −3.9		MARS +1.2		JUPITER −1.5		SATURN +0.6	
	G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
d h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
21 00	269 04.6	226 45.6	N13 16.1	230 13.8	N14 14.3	192 37.5	N22 23.4	132 18.2	N17 33.5
01	284 07.1	241 45.7	16.8	245 14.5	14.9	207 39.4	23.4	147 20.4	33.4
02	299 09.5	256 45.7	17.5	260 15.2	15.5	222 41.2	23.5	162 22.6	33.4
03	314 12.0	271 45.7	·· 18.2	275 15.8	·· 16.1	237 43.1	·· 23.5	177 24.8	·· 33.3
04	329 14.5	286 45.7	18.9	290 16.5	16.7	252 44.9	23.6	192 27.0	33.2
05	344 16.9	301 45.7	19.6	305 17.2	17.3	267 46.8	23.7	207 29.2	33.1
06	359 19.4	316 45.8	N13 20.3	320 17.9	N14 17.8	282 48.6	N22 23.7	222 31.4	N17 33.1
07	14 21.9	331 45.8	21.0	335 18.6	18.4	297 50.5	23.8	237 33.6	33.0
08	29 24.3	346 45.8	21.7	350 19.2	19.0	312 52.3	23.8	252 35.8	32.9
T 09	44 26.8	1 45.8	·· 22.4	5 19.9	·· 19.6	327 54.1	·· 23.9	267 38.0	·· 32.8
U 10	59 29.3	16 45.8	23.1	20 20.6	20.2	342 56.0	23.9	282 40.2	32.8
E 11	74 31.7	31 45.8	23.8	35 21.3	20.8	357 57.8	24.0	297 42.4	32.7
S 12	89 34.2	46 45.8	N13 24.5	50 22.0	N14 21.3	12 59.7	N22 24.0	312 44.6	N17 32.6
D 13	104 36.7	61 45.9	25.2	65 22.6	21.9	28 01.5	24.1	327 46.8	32.5
A 14	119 39.1	76 45.9	25.8	80 23.3	22.5	43 03.4	24.2	342 49.0	32.5
Y 15	134 41.6	91 45.9	·· 26.5	95 24.0	·· 23.1	58 05.2	·· 24.2	357 51.2	·· 32.4
16	149 44.0	106 45.9	27.2	110 24.7	23.7	73 07.1	24.3	12 53.5	32.3
17	164 46.5	121 45.9	27.9	125 25.4	24.3	88 08.9	24.3	27 55.7	32.2
18	179 49.0	136 45.9	N13 28.6	140 26.0	N14 24.8	103 10.8	N22 24.4	42 57.9	N17 32.2
19	194 51.4	151 45.9	29.3	155 26.7	25.4	118 12.6	24.4	58 00.1	32.1
20	209 53.9	166 45.9	30.0	170 27.4	26.0	133 14.5	24.5	73 02.3	32.0
21	224 56.4	181 45.9	·· 30.7	185 28.1	·· 26.6	148 16.3	·· 24.6	88 04.5	·· 31.9
22	239 58.8	196 45.9	31.4	200 28.8	27.2	163 18.2	24.6	103 06.7	31.9
23	255 01.3	211 45.9	32.1	215 29.5	27.7	178 20.0	24.7	118 08.9	31.8
22 00	270 03.8	226 45.9	N13 32.8	230 30.1	N14 28.3	193 21.9	N22 24.7	133 11.1	N17 31.7
01	285 06.2	241 45.9	33.5	245 30.8	28.9	208 23.7	24.8	148 13.3	31.6
02	300 08.7	256 45.9	34.2	260 31.5	29.5	223 25.5	24.8	163 15.5	31.6
03	315 11.1	271 45.9	·· 34.9	275 32.2	·· 30.1	238 27.4	·· 24.9	178 17.7	·· 31.5
04	330 13.6	286 45.9	35.6	290 32.9	30.6	253 29.2	24.9	193 19.9	31.4
05	345 16.1	301 45.9	36.3	305 33.5	31.2	268 31.1	25.0	208 22.1	31.3
06	0 18.5	316 45.9	N13 36.9	320 34.2	N14 31.8	283 32.9	N22 25.1	223 24.3	N17 31.3
W 07	15 21.0	331 45.9	37.6	335 34.9	32.4	298 34.8	25.1	238 26.5	31.2
E 08	30 23.5	346 45.9	38.3	350 35.6	33.0	313 36.6	25.2	253 28.7	31.1
D 09	45 25.9	1 45.9	·· 39.0	5 36.3	·· 33.5	328 38.5	·· 25.2	268 30.9	·· 31.0
N 10	60 28.4	16 45.9	39.7	20 36.9	34.1	343 40.3	25.3	283 33.1	31.0
E 11	75 30.9	31 45.9	40.4	35 37.6	34.7	358 42.2	25.3	298 35.3	30.9
S 12	90 33.3	46 45.9	N13 41.1	50 38.3	N14 35.3	13 44.0	N22 25.4	313 37.5	N17 30.8
D 13	105 35.8	61 45.9	41.8	65 39.0	35.9	28 45.9	25.4	328 39.7	30.7
A 14	120 38.3	76 45.9	42.5	80 39.7	36.4	43 47.7	25.5	343 41.9	30.7
Y 15	135 40.7	91 45.9	·· 43.2	95 40.3	·· 37.0	58 49.6	·· 25.5	358 44.1	·· 30.6
16	150 43.2	106 45.9	43.9	110 41.0	37.6	73 51.4	25.6	13 46.3	30.5
17	165 45.6	121 45.9	44.6	125 41.7	38.2	88 53.3	25.7	28 48.5	30.4
18	180 48.1	136 45.9	N13 45.3	140 42.4	N14 38.7	103 55.1	N22 25.7	43 50.7	N17 30.4
19	195 50.6	151 45.9	46.0	155 43.0	39.3	118 57.0	25.8	58 52.9	30.3
20	210 53.0	166 45.9	46.6	170 43.7	39.9	133 58.8	25.8	73 55.1	30.2
21	225 55.5	181 45.8	·· 47.3	185 44.4	·· 40.5	149 00.7	·· 25.9	88 57.3	·· 30.1
22	240 58.0	196 45.8	48.0	200 45.1	41.0	164 02.5	25.9	103 59.5	30.0
23	256 00.4	211 45.8	48.7	215 45.8	41.6	179 04.4	26.0	119 01.7	30.0
23 00	271 02.9	226 45.8	N13 49.4	230 46.4	N14 42.2	194 06.2	N22 26.0	134 03.9	N17 29.9
01	286 05.4	241 45.8	50.1	245 47.1	42.8	209 08.0	26.1	149 06.1	29.8
02	301 07.8	256 45.8	50.8	260 47.8	43.3	224 09.9	26.1	164 08.3	29.7
03	316 10.3	271 45.8	·· 51.5	275 48.5	·· 43.9	239 11.7	·· 26.2	179 10.5	·· 29.7
04	331 12.8	286 45.7	52.2	290 49.2	44.5	254 13.6	26.3	194 12.7	29.6
05	346 15.2	301 45.7	52.9	305 49.8	45.1	269 15.4	26.3	209 14.9	29.5
06	1 17.7	316 45.7	N13 53.6	320 50.5	N14 45.6	284 17.3	N22 26.4	224 17.1	N17 29.4
07	16 20.1	331 45.7	54.3	335 51.2	46.2	299 19.1	26.4	239 19.3	29.4
T 08	31 22.6	346 45.7	54.9	350 51.9	46.8	314 21.0	26.5	254 21.5	29.3
H 09	46 25.1	1 45.6	·· 55.6	5 52.6	·· 47.3	329 22.8	·· 26.5	269 23.7	·· 29.2
U 10	61 27.5	16 45.6	56.3	20 53.2	47.9	344 24.7	26.6	284 25.9	29.1
R 11	76 30.0	31 45.6	57.0	35 53.9	48.5	359 26.5	26.6	299 28.1	29.1
S 12	91 32.5	46 45.6	N13 57.7	50 54.6	N14 49.1	14 28.4	N22 26.7	314 30.3	N17 29.0
D 13	106 34.9	61 45.5	58.4	65 55.3	49.6	29 30.2	26.7	329 32.5	28.9
A 14	121 37.4	76 45.5	59.1	80 56.0	50.2	44 32.1	26.8	344 34.7	28.8
Y 15	136 39.9	91 45.5	13 59.8	95 56.6	·· 50.8	59 33.9	·· 26.8	359 36.9	·· 28.8
16	151 42.3	106 45.5	14 00.5	110 57.3	51.3	74 35.8	26.9	14 39.1	28.7
17	166 44.8	121 45.4	01.2	125 58.0	51.9	89 37.6	27.0	29 41.3	28.6
18	181 47.2	136 45.4	N14 01.8	140 58.7	N14 52.5	104 39.5	N22 27.0	44 43.5	N17 28.5
19	196 49.7	151 45.4	02.5	155 59.3	53.0	119 41.3	27.1	59 45.7	28.4
20	211 52.2	166 45.4	03.2	171 00.0	53.6	134 43.2	27.1	74 47.9	28.4
21	226 54.6	181 45.3	·· 03.9	186 00.7	·· 54.2	149 45.0	·· 27.2	89 50.1	·· 28.3
22	241 57.1	196 45.3	04.6	201 01.4	54.8	164 46.9	27.2	104 52.3	28.2
23	256 59.6	211 45.3	05.3	216 02.1	55.3	179 48.7	27.3	119 54.5	28.1
Mer. Pass.	h m 5 58.8	*v* 0.0	*d* 0.7	*v* 0.7	*d* 0.6	*v* 1.8	*d* 0.1	*v* 2.2	*d* 0.1

STARS

Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 39.2	S40 23.6
Achernar	335 47.2	S57 20.8
Acrux	173 39.5	S62 58.8
Adhara	255 34.2	S28 56.6
Aldebaran	291 20.8	N16 27.7
Alioth	166 44.4	N56 05.2
Alkaid	153 20.1	N49 25.8
Al Na'ir	28 17.5	S47 03.9
Alnilam	276 14.2	S 1 13.1
Alphard	218 22.9	S 8 33.8
Alphecca	126 33.7	N26 47.6
Alpheratz	358 11.5	N28 57.8
Altair	62 34.3	N 8 48.6
Ankaa	353 42.5	S42 25.4
Antares	112 59.2	S26 22.9
Arcturus	146 20.3	N19 18.1
Atria	108 24.8	S68 59.3
Avior	234 29.6	S59 26.5
Bellatrix	279 01.4	N 6 19.7
Betelgeuse	271 31.0	N 7 24.1
Canopus	264 08.7	S52 41.2
Capella	281 15.0	N45 58.4
Deneb	49 49.5	N45 12.0
Denebola	183 01.3	N14 41.9
Diphda	349 23.1	S18 06.5
Dubhe	194 25.1	N61 52.6
Elnath	278 47.3	N28 35.2
Eltanin	90 58.2	N51 29.6
Enif	34 13.5	N 9 46.3
Fomalhaut	15 53.7	S29 44.3
Gacrux	172 31.0	S56 59.5
Gienah	176 20.2	S17 25.1
Hadar	149 26.0	S60 16.1
Hamal	328 31.5	N23 21.2
Kaus Aust.	84 19.3	S34 23.6
Kochab	137 18.2	N74 15.2
Markab	14 05.2	N15 05.0
Menkar	314 43.6	N 4 00.0
Menkent	148 39.3	S36 15.7
Miaplacidus	221 45.9	S69 37.8
Mirfak	309 19.6	N49 46.7
Nunki	76 31.5	S26 19.4
Peacock	54 01.4	S56 48.2
Pollux	244 01.2	N28 04.8
Procyon	245 28.4	N 5 16.9
Rasalhague	96 31.3	N12 34.7
Regulus	208 12.5	N12 04.6
Rigel	281 38.4	S 8 13.7
Rigil Kent.	140 28.2	S60 44.7
Sabik	102 43.3	S15 41.8
Schedar	350 11.5	N56 24.6
Shaula	96 58.3	S37 05.2
Sirius	258 58.0	S16 41.3
Spica	158 59.7	S11 02.7
Suhail	223 12.7	S43 20.8
Vega	80 56.9	N38 45.8
Zuben'ubi	137 35.2	S15 56.9

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	316 42.2	8 53
Mars	320 26.4	8 38
Jupiter	283 18.1	11 05
Saturn	223 07.3	15 05

	G.M.T.	SUN G.H.A.	SUN Dec.	MOON G.H.A.	MOON *v*	MOON Dec.	MOON *d*	MOON H.P.
	d h	° ′	° ′	° ′	′	° ′	′	′
TUESDAY	21 00	179 36.3	N23 26.3	130 55.4	12.7	N11 21.4	8.2	55.6
	01	194 36.2	26.3	145 27.1	12.7	11 13.2	8.2	55.6
	02	209 36.1	26.3	159 58.8	12.7	11 05.0	8.3	55.6
	03	224 35.9	·· 26.3	174 30.5	12.7	10 56.7	8.4	55.7
	04	239 35.8	26.3	189 02.2	12.7	10 48.3	8.4	55.7
	05	254 35.7	26.3	203 33.9	12.8	10 39.9	8.5	55.7
	06	269 35.5	N23 26.3	218 05.7	12.7	N10 31.4	8.5	55.7
	07	284 35.4	26.3	232 37.4	12.8	10 22.9	8.6	55.8
	08	299 35.3	26.4	247 09.2	12.7	10 14.3	8.6	55.8
	09	314 35.1	·· 26.4	261 40.9	12.8	10 05.7	8.7	55.8
	10	329 35.0	26.4	276 12.7	12.7	9 57.0	8.7	55.8
	11	344 34.8	26.4	290 44.4	12.8	9 48.3	8.8	55.9
	12	359 34.7	N23 26.4	305 16.2	12.7	N 9 39.5	8.8	55.9
	13	14 34.6	26.4	319 47.9	12.8	9 30.7	8.9	55.9
	14	29 34.4	26.4	334 19.7	12.8	9 21.8	9.0	55.9
	15	44 34.3	·· 26.4	348 51.5	12.7	9 12.8	9.0	55.9
	16	59 34.2	26.4	3 23.2	12.8	9 03.8	9.0	56.0
	17	74 34.0	26.3	17 55.0	12.8	8 54.8	9.1	56.0
	18	89 33.9	N23 26.3	32 26.8	12.7	N 8 45.7	9.1	56.0
	19	104 33.8	26.3	46 58.5	12.8	8 36.6	9.2	56.0
	20	119 33.6	26.3	61 30.3	12.8	8 27.4	9.3	56.1
	21	134 33.5	·· 26.3	76 02.1	12.7	8 18.1	9.2	56.1
	22	149 33.3	26.3	90 33.8	12.8	8 08.9	9.4	56.1
	23	164 33.2	26.3	105 05.6	12.8	7 59.5	9.3	56.1
WEDNESDAY	22 00	179 33.1	N23 26.3	119 37.4	12.7	N 7 50.2	9.5	56.2
	01	194 32.9	26.3	134 09.1	12.8	7 40.7	9.4	56.2
	02	209 32.8	26.3	148 40.9	12.7	7 31.3	9.5	56.2
	03	224 32.7	·· 26.3	163 12.6	12.8	7 21.8	9.6	56.3
	04	239 32.5	26.3	177 44.4	12.7	7 12.2	9.6	56.3
	05	254 32.4	26.3	192 16.1	12.8	7 02.6	9.6	56.3
	06	269 32.3	N23 26.2	206 47.9	12.7	N 6 53.0	9.7	56.3
	07	284 32.1	26.2	221 19.6	12.7	6 43.3	9.7	56.4
	08	299 32.0	26.2	235 51.3	12.7	6 33.6	9.7	56.4
	09	314 31.8	·· 26.2	250 23.0	12.7	6 23.9	9.8	56.4
	10	329 31.7	26.2	264 54.7	12.7	6 14.1	9.9	56.4
	11	344 31.6	26.2	279 26.4	12.7	6 04.2	9.8	56.5
	12	359 31.4	N23 26.2	293 58.1	12.7	N 5 54.4	9.9	56.5
	13	14 31.3	26.1	308 29.8	12.7	5 44.5	10.0	56.5
	14	29 31.2	26.1	323 01.5	12.6	5 34.5	10.0	56.5
	15	44 31.0	·· 26.1	337 33.1	12.7	5 24.5	10.0	56.6
	16	59 30.9	26.1	352 04.8	12.6	5 14.5	10.0	56.6
	17	74 30.8	26.1	6 36.4	12.6	5 04.5	10.1	56.6
	18	89 30.6	N23 26.0	21 08.0	12.6	N 4 54.4	10.1	56.7
	19	104 30.5	26.0	35 39.6	12.6	4 44.3	10.2	56.7
	20	119 30.4	26.0	50 11.2	12.6	4 34.1	10.1	56.7
	21	134 30.2	·· 26.0	64 42.8	12.5	4 24.0	10.3	56.7
	22	149 30.1	26.0	79 14.3	12.6	4 13.7	10.2	56.8
	23	164 29.9	25.9	93 45.9	12.5	4 03.5	10.3	56.8
THURSDAY	23 00	179 29.8	N23 25.9	108 17.4	12.5	N 3 53.2	10.3	56.8
	01	194 29.7	25.9	122 48.9	12.5	3 42.9	10.3	56.9
	02	209 29.5	25.8	137 20.4	12.5	3 32.6	10.3	56.9
	03	224 29.4	·· 25.8	151 51.9	12.4	3 22.3	10.4	56.9
	04	239 29.3	25.8	166 23.3	12.5	3 11.9	10.4	57.0
	05	254 29.1	25.8	180 54.8	12.4	3 01.5	10.5	57.0
	06	269 29.0	N23 25.7	195 26.2	12.4	N 2 51.0	10.4	57.0
	07	284 28.9	25.7	209 57.6	12.3	2 40.6	10.5	57.0
	08	299 28.7	25.7	224 28.9	12.4	2 30.1	10.5	57.1
	09	314 28.6	·· 25.6	239 00.3	12.3	2 19.6	10.5	57.1
	10	329 28.5	25.6	253 31.6	12.3	2 09.1	10.6	57.1
	11	344 28.3	25.6	268 02.9	12.2	1 58.5	10.5	57.2
	12	359 28.2	N23 25.5	282 34.1	12.3	N 1 48.0	10.6	57.2
	13	14 28.1	25.5	297 05.4	12.2	1 37.4	10.6	57.2
	14	29 27.9	25.5	311 36.6	12.2	1 26.8	10.7	57.3
	15	44 27.8	·· 25.4	326 07.8	12.1	1 16.1	10.6	57.3
	16	59 27.7	25.4	340 38.9	12.2	1 05.5	10.7	57.3
	17	74 27.5	25.4	355 10.1	12.0	0 54.8	10.6	57.3
	18	89 27.4	N23 25.3	9 41.1	12.1	N 0 44.2	10.7	57.4
	19	104 27.3	25.3	24 12.2	12.0	0 33.5	10.7	57.4
	20	119 27.1	25.2	38 43.2	12.0	0 22.8	10.7	57.4
	21	134 27.0	·· 25.2	53 14.2	12.0	0 12.1	10.8	57.5
	22	149 26.8	25.2	67 45.2	11.9	N 0 01.3	10.7	57.5
	23	164 26.7	25.1	82 16.1	11.9	S 0 09.4	10.8	57.5
		S.D. 15.8	*d* 0.0	S.D.	15.2		15.4	15.6

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 21	Moonrise 22	Moonrise 23	Moonrise 24
°	h m	h m	h m	h m	h m	h m	h m
N 72	□	□	□	07 15	08 59	10 44	12 31
N 70	□	□	□	07 32	09 09	10 47	12 27
68	□	□	□	07 46	09 16	10 49	12 24
66	□	□	□	07 57	09 23	10 51	12 21
64	////	////	01 31	08 06	09 28	10 52	12 19
62	////	////	02 09	08 14	09 33	10 54	12 17
60	////	00 49	02 36	08 20	09 36	10 55	12 16
N 58	////	01 40	02 56	08 26	09 40	10 56	12 14
56	////	02 10	03 13	08 32	09 43	10 57	12 13
54	00 45	02 33	03 27	08 36	09 46	10 58	12 12
52	01 32	02 51	03 40	08 40	09 48	10 58	12 11
50	02 00	03 06	03 51	08 44	09 51	10 59	12 10
45	02 46	03 36	04 13	08 53	09 56	11 01	12 07
N 40	03 17	03 59	04 31	08 59	10 00	11 02	12 06
35	03 40	04 17	04 46	09 05	10 04	11 03	12 04
30	03 59	04 32	05 00	09 11	10 07	11 04	12 03
20	04 28	04 57	05 22	09 20	10 12	11 06	12 01
N 10	04 50	05 18	05 41	09 27	10 17	11 07	11 59
0	05 09	05 36	05 58	09 35	10 22	11 09	11 57
S 10	05 26	05 53	06 16	09 42	10 26	11 10	11 55
20	05 43	06 10	06 34	09 50	10 31	11 12	11 53
30	05 59	06 29	06 56	09 59	10 36	11 13	11 51
35	06 08	06 40	07 08	10 04	10 39	11 14	11 50
40	06 17	06 52	07 22	10 10	10 43	11 15	11 48
45	06 28	07 05	07 39	10 17	10 47	11 17	11 47
S 50	06 40	07 21	08 00	10 25	10 52	11 18	11 45
52	06 45	07 29	08 10	10 28	10 54	11 19	11 44
54	06 51	07 37	08 21	10 32	10 57	11 20	11 43
56	06 57	07 46	08 33	10 37	10 59	11 21	11 42
58	07 04	07 56	08 48	10 42	11 02	11 22	11 41
S 60	07 11	08 08	09 06	10 47	11 06	11 23	11 40

Lat.	Sunset	Twilight Civil	Twilight Naut.	Moonset 21	Moonset 22	Moonset 23	Moonset 24
°	h m	h m	h m	h m	h m	h m	h m
N 72	□	□	□	23 40	23 34	23 27	23 21
N 70	□	□	□	23 29	23 28	23 28	23 27
68	□	□	□	23 20	23 24	23 28	23 32
66	□	□	□	23 12	23 21	23 28	23 37
64	22 33	////	////	23 05	23 17	23 29	23 40
62	21 54	////	////	23 00	23 15	23 29	23 44
60	21 28	23 14	////	22 55	23 12	23 29	23 47
N 58	21 07	22 23	////	22 51	23 10	23 29	23 49
56	20 51	21 53	////	22 47	23 08	23 29	23 51
54	20 36	21 31	23 19	22 43	23 07	23 30	23 53
52	20 24	21 13	22 31	22 40	23 05	23 30	23 55
50	20 13	20 58	22 03	22 37	23 04	23 30	23 57
45	19 50	20 28	21 18	22 31	23 01	23 30	24 01
N 40	19 32	20 05	20 47	22 25	22 58	23 30	24 04
35	19 17	19 47	20 24	22 21	22 56	23 31	24 07
30	19 04	19 32	20 05	22 17	22 54	23 31	24 09
20	18 42	19 07	19 36	22 09	22 50	23 31	24 13
N 10	18 23	18 46	19 13	22 03	22 47	23 31	24 17
0	18 06	18 28	18 54	21 57	22 44	23 31	24 20
S 10	17 48	18 11	18 37	21 51	22 41	23 32	24 24
20	17 30	17 54	18 21	21 45	22 38	23 32	24 27
30	17 08	17 35	18 05	21 37	22 34	23 32	24 32
35	16 56	17 24	17 56	21 33	22 32	23 32	24 34
40	16 42	17 12	17 46	21 28	22 29	23 32	24 37
45	16 25	16 59	17 36	21 23	22 27	23 32	24 40
S 50	16 04	16 43	17 24	21 16	22 23	23 32	24 44
52	15 54	16 35	17 19	21 13	22 22	23 32	24 45
54	15 43	16 27	17 13	21 09	22 20	23 32	24 47
56	15 30	16 18	17 07	21 05	22 18	23 33	24 50
58	15 16	16 08	17 00	21 01	22 16	23 33	24 52
S 60	14 58	15 56	16 53	20 56	22 13	23 33	24 54

Day	SUN Eqn. of Time 00ʰ	SUN Eqn. of Time 12ʰ	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
	m s	m s	h m	h m	h m	d	
21	01 34	01 41	12 02	15 46	03 23	05	🌒
22	01 47	01 54	12 02	16 33	04 09	06	
23	02 00	02 07	12 02	17 20	04 56	07	

1977 JUNE 24, 25, 26 (FRI., SAT., SUN.)

G.M.T.	ARIES	VENUS −3.9		MARS +1.2		JUPITER −1.5		SATURN +0.6	
	G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
d h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
24 00	272 02.0	226 45.2	N14 06.0	231 02.7	N14 55.9	194 50.6	N22 27.3	134 56.7	N17 28.1
01	287 04.5	241 45.2	06.7	246 03.4	56.5	209 52.4	27.4	149 58.9	28.0
02	302 07.0	256 45.2	07.4	261 04.1	57.0	224 54.3	27.4	165 01.1	27.9
03	317 09.4	271 45.1	· · 08.0	276 04.8	· · 57.6	239 56.1	· · 27.5	180 03.3	· · 27.8
04	332 11.9	286 45.1	08.7	291 05.5	58.2	254 58.0	27.5	195 05.5	27.8
05	347 14.4	301 45.1	09.4	306 06.1	58.7	269 59.8	27.6	210 07.7	27.7
06	2 16.8	316 45.0	N14 10.1	321 06.8	N14 59.3	285 01.7	N22 27.7	225 09.8	N17 27.6
07	17 19.3	331 45.0	10.8	336 07.5	14 59.9	300 03.5	27.7	240 12.0	27.5
08	32 21.7	346 45.0	11.5	351 08.2	15 00.4	315 05.4	27.8	255 14.2	27.4
F 09	47 24.2	1 44.9	· · 12.2	6 08.8	· · 01.0	330 07.2	· · 27.8	270 16.4	· · 27.4
R 10	62 26.7	16 44.9	12.9	21 09.5	01.6	345 09.1	27.9	285 18.6	27.3
I 11	77 29.1	31 44.8	13.5	36 10.2	02.1	0 10.9	27.9	300 20.8	27.2
D 12	92 31.6	46 44.8	N14 14.2	51 10.9	N15 02.7	15 12.8	N22 28.0	315 23.0	N17 27.1
A 13	107 34.1	61 44.8	14.9	66 11.6	03.2	30 14.6	28.0	330 25.2	27.1
Y 14	122 36.5	76 44.7	15.6	81 12.2	03.8	45 16.5	28.1	345 27.4	27.0
15	137 39.0	91 44.7	· · 16.3	96 12.9	· · 04.4	60 18.3	· · 28.1	0 29.6	· · 26.9
16	152 41.5	106 44.6	17.0	111 13.6	04.9	75 20.2	28.2	15 31.8	26.8
17	167 43.9	121 44.6	17.7	126 14.3	05.5	90 22.0	28.2	30 34.0	26.8
18	182 46.4	136 44.5	N14 18.4	141 14.9	N15 06.1	105 23.9	N22 28.3	45 36.2	N17 26.7
19	197 48.9	151 44.5	19.0	156 15.6	06.6	120 25.7	28.3	60 38.4	26.6
20	212 51.3	166 44.4	19.7	171 16.3	07.2	135 27.6	28.4	75 40.6	26.5
21	227 53.8	181 44.4	· · 20.4	186 17.0	· · 07.8	150 29.4	· · 28.4	90 42.8	· · 26.4
22	242 56.2	196 44.3	21.1	201 17.7	08.3	165 31.3	28.5	105 45.0	26.4
23	257 58.7	211 44.3	21.8	216 18.3	08.9	180 33.1	28.5	120 47.2	26.3
25 00	273 01.2	226 44.2	N14 22.5	231 19.0	N15 09.4	195 35.0	N22 28.6	135 49.4	N17 26.2
01	288 03.6	241 44.2	23.2	246 19.7	10.0	210 36.8	28.7	150 51.6	26.1
02	303 06.1	256 44.1	23.8	261 20.4	10.6	225 38.7	28.7	165 53.8	26.1
03	318 08.6	271 44.1	· · 24.5	276 21.0	· · 11.1	240 40.5	· · 28.8	180 56.0	· · 26.0
04	333 11.0	286 44.0	25.2	291 21.7	11.7	255 42.4	28.8	195 58.2	25.9
05	348 13.5	301 44.0	25.9	306 22.4	12.2	270 44.2	28.9	211 00.4	25.8
06	3 16.0	316 43.9	N14 26.6	321 23.1	N15 12.8	285 46.1	N22 28.9	226 02.6	N17 25.7
07	18 18.4	331 43.9	27.3	336 23.8	13.4	300 47.9	29.0	241 04.8	25.7
S 08	33 20.9	346 43.8	27.9	351 24.4	13.9	315 49.8	29.0	256 06.9	25.6
A 09	48 23.3	1 43.8	· · 28.6	6 25.1	· · 14.5	330 51.6	· · 29.1	271 09.1	· · 25.5
T 10	63 25.8	16 43.7	29.3	21 25.8	15.0	345 53.5	29.1	286 11.3	25.4
U 11	78 28.3	31 43.7	30.0	36 26.5	15.6	0 55.3	29.2	301 13.5	25.4
R 12	93 30.7	46 43.6	N14 30.7	51 27.1	N15 16.2	15 57.2	N22 29.2	316 15.7	N17 25.3
D 13	108 33.2	61 43.5	31.4	66 27.8	16.7	30 59.0	29.3	331 17.9	25.2
A 14	123 35.7	76 43.5	32.1	81 28.5	17.3	46 00.9	29.3	346 20.1	25.1
Y 15	138 38.1	91 43.4	· · 32.7	96 29.2	· · 17.8	61 02.7	· · 29.4	1 22.3	· · 25.0
16	153 40.6	106 43.4	33.4	111 29.8	18.4	76 04.6	29.4	16 24.5	25.0
17	168 43.1	121 43.3	34.1	126 30.5	18.9	91 06.4	29.5	31 26.7	24.9
18	183 45.5	136 43.2	N14 34.8	141 31.2	N15 19.5	106 08.3	N22 29.5	46 28.9	N17 24.8
19	198 48.0	151 43.2	35.5	156 31.9	20.1	121 10.1	29.6	61 31.1	24.7
20	213 50.5	166 43.1	36.1	171 32.6	20.6	136 12.0	29.6	76 33.3	24.7
21	228 52.9	181 43.0	· · 36.8	186 33.2	· · 21.2	151 13.8	· · 29.7	91 35.5	· · 24.6
22	243 55.4	196 43.0	37.5	201 33.9	21.7	166 15.7	29.7	106 37.7	24.5
23	258 57.8	211 42.9	38.2	216 34.6	22.3	181 17.5	29.8	121 39.9	24.4
26 00	274 00.3	226 42.8	N14 38.9	231 35.3	N15 22.8	196 19.4	N22 29.8	136 42.1	N17 24.3
01	289 02.8	241 42.8	39.6	246 35.9	23.4	211 21.2	29.9	151 44.2	24.3
02	304 05.2	256 42.7	40.2	261 36.6	23.9	226 23.1	29.9	166 46.4	24.2
03	319 07.7	271 42.6	· · 40.9	276 37.3	· · 24.5	241 24.9	· · 30.0	181 48.6	· · 24.1
04	334 10.2	286 42.6	41.6	291 38.0	25.0	256 26.8	30.0	196 50.8	24.0
05	349 12.6	301 42.5	42.3	306 38.6	25.6	271 28.6	30.1	211 53.0	24.0
06	4 15.1	316 42.4	N14 43.0	321 39.3	N15 26.2	286 30.5	N22 30.2	226 55.2	N17 23.9
07	19 17.6	331 42.3	43.6	336 40.0	26.7	301 32.3	30.2	241 57.4	23.8
08	34 20.0	346 42.3	44.3	351 40.7	27.3	316 34.2	30.3	256 59.6	23.7
S 09	49 22.5	1 42.2	· · 45.0	6 41.3	· · 27.8	331 36.0	· · 30.3	272 01.8	· · 23.6
U 10	64 25.0	16 42.1	45.7	21 42.0	28.4	346 37.9	30.4	287 04.0	23.6
N 11	79 27.4	31 42.0	46.4	36 42.7	28.9	1 39.7	30.4	302 06.2	23.5
D 12	94 29.9	46 42.0	N14 47.0	51 43.4	N15 29.5	16 41.6	N22 30.5	317 08.4	N17 23.4
A 13	109 32.3	61 41.9	47.7	66 44.1	30.0	31 43.4	30.5	332 10.6	23.3
Y 14	124 34.8	76 41.8	48.4	81 44.7	30.6	46 45.3	30.6	347 12.8	23.2
15	139 37.3	91 41.7	· · 49.1	96 45.4	· · 31.1	61 47.1	· · 30.6	2 15.0	· · 23.2
16	154 39.7	106 41.7	49.7	111 46.1	31.7	76 49.0	30.7	17 17.1	23.1
17	169 42.2	121 41.6	50.4	126 46.8	32.2	91 50.8	30.7	32 19.3	23.0
18	184 44.7	136 41.5	N14 51.1	141 47.4	N15 32.8	106 52.7	N22 30.8	47 21.5	N17 22.9
19	199 47.1	151 41.4	51.8	156 48.1	33.3	121 54.5	30.8	62 23.7	22.9
20	214 49.6	166 41.3	52.5	171 48.8	33.9	136 56.4	30.9	77 25.9	22.8
21	229 52.1	181 41.3	· · 53.1	186 49.5	· · 34.4	151 58.2	· · 30.9	92 28.1	· · 22.7
22	244 54.5	196 41.2	53.8	201 50.1	35.0	167 00.1	31.0	107 30.3	22.6
23	259 57.0	211 41.1	54.5	216 50.8	35.5	182 01.9	31.0	122 32.5	22.5
Mer. Pass.	h m 5 47.0	*v* −0.1	*d* 0.7	*v* 0.7	*d* 0.6	*v* 1.9	*d* 0.1	*v* 2.2	*d* 0.1

STARS		
Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 39.2	S40 23.6
Achernar	335 47.2	S57 20.8
Acrux	173 39.5	S62 58.8
Adhara	255 34.2	S28 56.6
Aldebaran	291 20.8	N16 27.7
Alioth	166 44.4	N56 05.2
Alkaid	153 20.1	N49 25.8
Al Na'ir	28 17.5	S47 03.9
Alnilam	276 14.2	S 1 13.1
Alphard	218 22.9	S 8 33.8
Alphecca	126 33.7	N26 47.6
Alpheratz	358 11.5	N28 57.9
Altair	62 34.3	N 8 48.6
Ankaa	353 42.5	S42 25.4
Antares	112 59.2	S26 22.9
Arcturus	146 20.3	N19 18.1
Atria	108 24.8	S68 59.3
Avior	234 29.6	S59 26.5
Bellatrix	279 01.4	N 6 19.7
Betelgeuse	271 31.0	N 7 24.1
Canopus	264 08.7	S52 41.1
Capella	281 15.0	N45 58.4
Deneb	49 49.5	N45 12.0
Denebola	183 01.3	N14 41.9
Diphda	349 23.1	S18 06.5
Dubhe	194 25.1	N61 52.6
Elnath	278 47.3	N28 35.2
Eltanin	90 58.2	N51 29.6
Enif	34 13.5	N 9 46.4
Fomalhaut	15 53.7	S29 44.3
Gacrux	172 31.0	S56 59.5
Gienah	176 20.2	S17 25.1
Hadar	149 26.0	S60 16.1
Hamal	328 31.5	N23 21.2
Kaus Aust.	84 19.3	S34 23.6
Kochab	137 18.3	N74 15.2
Markab	14 05.2	N15 05.0
Menkar	314 43.6	N 4 00.0
Menkent	148 39.3	S36 15.7
Miaplacidus	221 46.0	S69 37.8
Mirfak	309 19.5	N49 46.7
Nunki	76 31.5	S26 19.4
Peacock	54 01.3	S56 48.2
Pollux	244 01.2	N28 04.8
Procyon	245 28.4	N 5 16.9
Rasalhague	96 31.3	N12 34.7
Regulus	208 12.5	N12 04.6
Rigel	281 38.4	S 8 13.7
Rigil Kent.	140 28.3	S60 44.7
Sabik	102 43.3	S15 41.8
Schedar	350 11.4	N56 24.6
Shaula	96 58.3	S37 05.2
Sirius	258 58.0	S16 41.3
Spica	158 59.7	S11 02.7
Suhail	223 12.7	S43 20.8
Vega	80 56.9	N38 45.9
Zuben'ubi	137 35.2	S15 56.9

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	313 43.1	8 53
Mars	318 17.8	8 34
Jupiter	282 33.8	10 56
Saturn	222 48.2	14 55

1977 JUNE 24, 25, 26 (FRI., SAT., SUN.)

G.M.T.	SUN G.H.A.	SUN Dec.	MOON G.H.A.	v	MOON Dec.	d	H.P.
d h	° ′	° ′	° ′	′	° ′	′	′
24 00	179 26.6	N23 25.1	96 47.0	11.9	S 0 20.2	10.7	57.6
01	194 26.4	25.0	111 17.9	11.8	0 30.9	10.8	57.6
02	209 26.3	25.0	125 48.7	11.8	0 41.7	10.8	57.6
03	224 26.2	·· 25.0	140 19.5	11.8	0 52.5	10.7	57.7
04	239 26.0	24.9	154 50.3	11.7	1 03.2	10.8	57.7
05	254 25.9	24.9	169 21.0	11.7	1 14.0	10.8	57.7
06	269 25.8	N23 24.8	183 51.7	11.6	S 1 24.8	10.8	57.8
07	284 25.6	24.8	198 22.3	11.6	1 35.6	10.8	57.8
08	299 25.5	24.7	212 52.9	11.5	1 46.4	10.9	57.8
F 09	314 25.4	·· 24.7	227 23.4	11.5	1 57.3	10.8	57.9
R 10	329 25.2	24.6	241 53.9	11.5	2 08.1	10.8	57.9
I 11	344 25.1	24.6	256 24.4	11.4	2 18.9	10.8	57.9
D 12	359 25.0	N23 24.5	270 54.8	11.4	S 2 29.7	10.8	58.0
A 13	14 24.8	24.5	285 25.2	11.3	2 40.5	10.8	58.0
Y 14	29 24.7	24.4	299 55.5	11.3	2 51.3	10.8	58.0
15	44 24.6	·· 24.4	314 25.8	11.2	3 02.1	10.8	58.1
16	59 24.4	24.3	328 56.0	11.2	3 12.9	10.8	58.1
17	74 24.3	24.3	343 26.2	11.1	3 23.7	10.8	58.1
18	89 24.2	N23 24.2	357 56.3	11.1	S 3 34.5	10.8	58.2
19	104 24.0	24.1	12 26.4	11.1	3 45.3	10.8	58.2
20	119 23.9	24.1	26 56.5	11.0	3 56.1	10.8	58.2
21	134 23.8	·· 24.0	41 26.5	10.9	4 06.9	10.7	58.3
22	149 23.6	24.0	55 56.4	10.9	4 17.6	10.8	58.3
23	164 23.5	23.9	70 26.3	10.8	4 28.4	10.7	58.3
25 00	179 23.4	N23 23.9	84 56.1	10.8	S 4 39.1	10.7	58.4
01	194 23.2	23.8	99 25.9	10.7	4 49.8	10.8	58.4
02	209 23.1	23.7	113 55.6	10.6	5 00.6	10.6	58.4
03	224 23.0	·· 23.7	128 25.2	10.7	5 11.2	10.7	58.5
04	239 22.8	23.6	142 54.9	10.5	5 21.9	10.7	58.5
05	254 22.7	23.5	157 24.4	10.5	5 32.6	10.6	58.5
06	269 22.6	N23 23.5	171 53.9	10.4	S 5 43.2	10.7	58.6
07	284 22.4	23.4	186 23.3	10.4	5 53.9	10.6	58.6
S 08	299 22.3	23.3	200 52.7	10.3	6 04.5	10.6	58.6
A 09	314 22.2	·· 23.3	215 22.0	10.3	6 15.1	10.5	58.7
T 10	329 22.0	23.2	229 51.3	10.1	6 25.6	10.6	58.7
U 11	344 21.9	23.1	244 20.4	10.2	6 36.2	10.5	58.7
R 12	359 21.8	N23 23.1	258 49.6	10.0	S 6 46.7	10.5	58.8
D 13	14 21.6	23.0	273 18.6	10.0	6 57.2	10.4	58.8
A 14	29 21.5	22.9	287 47.6	10.0	7 07.6	10.5	58.8
Y 15	44 21.4	·· 22.9	302 16.6	9.8	7 18.1	10.4	58.9
16	59 21.3	22.8	316 45.4	9.9	7 28.5	10.4	58.9
17	74 21.1	22.7	331 14.3	9.7	7 38.9	10.3	58.9
18	89 21.0	N23 22.7	345 43.0	9.7	S 7 49.2	10.3	59.0
19	104 20.9	22.6	0 11.7	9.6	7 59.5	10.3	59.0
20	119 20.7	22.5	14 40.3	9.5	8 09.8	10.2	59.0
21	134 20.6	·· 22.4	29 08.8	9.5	8 20.0	10.2	59.1
22	149 20.5	22.4	43 37.3	9.4	8 30.2	10.2	59.1
23	164 20.3	22.3	58 05.7	9.3	8 40.4	10.1	59.1
26 00	179 20.2	N23 22.2	72 34.0	9.3	S 8 50.5	10.1	59.1
01	194 20.1	22.1	87 02.3	9.2	9 00.6	10.1	59.2
02	209 19.9	22.1	101 30.5	9.1	9 10.7	10.0	59.2
03	224 19.8	·· 22.0	115 58.6	9.0	9 20.7	10.0	59.2
04	239 19.7	21.9	130 26.6	9.0	9 30.7	9.9	59.3
05	254 19.5	21.8	144 54.6	8.9	9 40.6	9.9	59.3
06	269 19.4	N23 21.7	159 22.5	8.9	S 9 50.5	9.8	59.3
07	284 19.3	21.7	173 50.4	8.7	10 00.3	9.8	59.4
08	299 19.1	21.6	188 18.1	8.7	10 10.1	9.7	59.4
S 09	314 19.0	·· 21.5	202 45.8	8.6	10 19.8	9.7	59.4
U 10	329 18.9	21.4	217 13.4	8.5	10 29.5	9.6	59.5
N 11	344 18.8	21.3	231 40.9	8.5	10 39.1	9.5	59.5
D 12	359 18.6	N23 21.2	246 08.4	8.4	S10 48.6	9.6	59.5
A 13	14 18.5	21.1	260 35.8	8.3	10 58.2	9.4	59.6
Y 14	29 18.4	21.1	275 03.1	8.2	11 07.6	9.4	59.6
15	44 18.2	·· 21.0	289 30.3	8.2	11 17.0	9.4	59.6
16	59 18.1	20.9	303 57.5	8.1	11 26.4	9.2	59.7
17	74 18.0	20.8	318 24.6	8.0	11 35.6	9.3	59.7
18	89 17.8	N23 20.7	332 51.6	7.9	S11 44.9	9.1	59.7
19	104 17.7	20.6	347 18.5	7.8	11 54.0	9.1	59.7
20	119 17.6	20.5	1 45.3	7.8	12 03.1	9.0	59.8
21	134 17.4	·· 20.4	16 12.1	7.7	12 12.1	9.0	59.8
22	149 17.3	20.3	30 38.8	7.6	12 21.1	8.9	59.8
23	164 17.2	20.2	45 05.4	7.5	12 30.0	8.8	59.9
	S.D. 15.8	d 0.1	S.D. 15.8		16.0		16.2

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 24	Moonrise 25	Moonrise 26	Moonrise 27
°	h m	h m	h m	h m	h m	h m	h m
N 72	□	□	□	12 31	14 23	16 23	18 34
N 70	□	□	□	12 27	14 12	16 02	17 56
68	□	□	□	12 24	14 03	15 45	17 31
66	□	□	□	12 21	13 55	15 32	17 11
64	////	////	01 33	12 19	13 49	15 21	16 55
62	////	////	02 11	12 17	13 44	15 12	16 42
60	////	00 51	02 37	12 16	13 39	15 04	16 31
N 58	////	01 42	02 58	12 14	13 35	14 58	16 21
56	////	02 12	03 14	12 13	13 31	14 52	16 13
54	00 47	02 34	03 29	12 12	13 28	14 46	16 05
52	01 34	02 52	03 41	12 11	13 25	14 41	15 59
50	02 02	03 07	03 52	12 10	13 22	14 37	15 53
45	02 47	03 37	04 14	12 07	13 16	14 27	15 40
N 40	03 18	03 59	04 32	12 06	13 12	14 20	15 29
35	03 41	04 18	04 47	12 04	13 07	14 13	15 20
30	03 59	04 33	05 00	12 03	13 04	14 07	15 12
20	04 29	04 58	05 22	12 01	12 57	13 57	14 59
N 10	04 51	05 18	05 41	11 59	12 52	13 48	14 47
0	05 10	05 36	05 59	11 57	12 47	13 40	14 36
S 10	05 27	05 53	06 16	11 55	12 42	13 32	14 25
20	05 43	06 11	06 35	11 53	12 37	13 23	14 13
30	06 00	06 30	06 56	11 51	12 30	13 13	14 00
35	06 09	06 40	07 08	11 50	12 27	13 07	13 52
40	06 18	06 52	07 23	11 48	12 23	13 01	13 44
45	06 28	07 06	07 39	11 47	12 19	12 54	13 34
S 50	06 40	07 22	08 00	11 45	12 13	12 45	13 22
52	06 45	07 29	08 10	11 44	12 11	12 41	13 16
54	06 51	07 37	08 21	11 43	12 08	12 36	13 10
56	06 57	07 46	08 34	11 42	12 05	12 31	13 03
58	07 04	07 57	08 48	11 41	12 02	12 26	12 55
S 60	07 11	08 08	09 06	11 40	11 58	12 20	12 47

Lat.	Sunset	Twilight Civil	Twilight Naut.	Moonset 24	Moonset 25	Moonset 26	Moonset 27
°	h m	h m	h m	h m	h m	h m	h m
N 72	□	□	□	23 21	23 13	23 05	22 52
N 70	□	□	□	23 27	23 27	23 27	23 30
68	□	□	□	23 32	23 37	23 45	23 57
66	□	□	□	23 37	23 46	23 59	24 18
64	22 32	////	////	23 40	23 54	24 11	00 11
62	21 54	////	////	23 44	24 00	00 00	00 21
60	21 28	23 13	////	23 47	24 06	00 06	00 29
N 58	21 07	22 23	////	23 49	24 11	00 11	00 37
56	20 51	21 53	////	23 51	24 16	00 16	00 44
54	20 36	21 31	23 17	23 53	24 20	00 20	00 50
52	20 24	21 13	22 31	23 55	24 23	00 23	00 55
50	20 13	20 58	22 03	23 57	24 27	00 27	01 00
45	19 51	20 28	21 18	24 01	00 01	00 34	01 11
N 40	19 33	20 06	20 47	24 04	00 04	00 40	01 20
35	19 18	19 47	20 24	24 07	00 07	00 45	01 28
30	19 05	19 32	20 06	24 09	00 09	00 50	01 34
20	18 43	19 07	19 37	24 13	00 13	00 58	01 46
N 10	18 24	18 47	19 14	24 17	00 17	01 05	01 56
0	18 06	18 29	18 55	24 20	00 20	01 12	02 06
S 10	17 49	18 12	18 38	24 24	00 24	01 18	02 16
20	17 30	17 54	18 22	24 27	00 27	01 25	02 26
30	17 09	17 35	18 05	24 32	00 32	01 34	02 38
35	16 57	17 25	17 57	24 34	00 34	01 38	02 45
40	16 43	17 13	17 47	24 37	00 37	01 44	02 52
45	16 26	17 00	17 37	24 40	00 40	01 50	03 01
S 50	16 05	16 44	17 25	24 44	00 44	01 57	03 12
52	15 55	16 36	17 20	24 45	00 45	02 01	03 18
54	15 44	16 28	17 14	24 47	00 47	02 05	03 23
56	15 31	16 19	17 08	24 50	00 50	02 09	03 30
58	15 17	16 09	17 01	24 52	00 52	02 13	03 37
S 60	14 59	15 57	16 54	24 54	00 54	02 19	03 45

Day	SUN Eqn. of Time 00ʰ	SUN Eqn. of Time 12ʰ	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
	m s	m s	h m	h m	h m	d	
24	02 13	02 20	12 02	18 09	05 44	08	
25	02 26	02 33	12 03	18 59	06 34	09	◐
26	02 39	02 45	12 03	19 53	07 26	10	

1977 JUNE 27, 28, 29 (MON., TUES., WED.)

	G.M.T.	ARIES	VENUS −3.8		MARS +1.2		JUPITER −1.5		SATURN +0.6	
		G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
	d h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
	27 00	274 59.4	226 41.0	N14 55.2	231 51.5	N15 36.1	197 03.8	N22 31.1	137 34.7	N17 22.5
	01	290 01.9	241 40.9	55.8	246 52.2	36.6	212 05.6	31.1	152 36.9	22.4
	02	305 04.4	256 40.8	56.5	261 52.8	37.2	227 07.5	31.2	167 39.1	22.3
	03	320 06.8	271 40.7	·· 57.2	276 53.5	·· 37.7	242 09.4	·· 31.2	182 41.3	·· 22.2
	04	335 09.3	286 40.7	57.9	291 54.2	38.3	257 11.2	31.3	197 43.4	22.1
	05	350 11.8	301 40.6	58.5	306 54.9	38.8	272 13.1	31.3	212 45.6	22.1
	06	5 14.2	316 40.5	N14 59.2	321 55.5	N15 39.4	287 14.9	N22 31.4	227 47.8	N17 22.0
	07	20 16.7	331 40.4	14 59.9	336 56.2	39.9	302 16.8	31.4	242 50.0	21.9
	08	35 19.2	346 40.3	15 00.6	351 56.9	40.4	317 18.6	31.5	257 52.2	21.8
M	09	50 21.6	1 40.2	·· 01.2	6 57.6	·· 41.0	332 20.5	·· 31.5	272 54.4	·· 21.8
O	10	65 24.1	16 40.1	01.9	21 58.2	41.5	347 22.3	31.6	287 56.6	21.7
N	11	80 26.6	31 40.0	02.6	36 58.9	42.1	2 24.2	31.6	302 58.8	21.6
D	12	95 29.0	46 39.9	N15 03.3	51 59.6	N15 42.6	17 26.0	N22 31.7	318 01.0	N17 21.5
A	13	110 31.5	61 39.8	03.9	67 00.3	43.2	32 27.9	31.7	333 03.2	21.4
Y	14	125 33.9	76 39.7	04.6	82 00.9	43.7	47 29.7	31.8	348 05.4	21.4
	15	140 36.4	91 39.7	·· 05.3	97 01.6	·· 44.3	62 31.6	·· 31.8	3 07.5	·· 21.3
	16	155 38.9	106 39.6	06.0	112 02.3	44.8	77 33.4	31.9	18 09.7	21.2
	17	170 41.3	121 39.5	06.6	127 03.0	45.3	92 35.3	31.9	33 11.9	21.1
	18	185 43.8	136 39.4	N15 07.3	142 03.6	N15 45.9	107 37.1	N22 32.0	48 14.1	N17 21.0
	19	200 46.3	151 39.3	08.0	157 04.3	46.4	122 39.0	32.0	63 16.3	21.0
	20	215 48.7	166 39.2	08.6	172 05.0	47.0	137 40.8	32.1	78 18.5	20.9
	21	230 51.2	181 39.1	·· 09.3	187 05.7	·· 47.5	152 42.7	·· 32.1	93 20.7	·· 20.8
	22	245 53.7	196 39.0	10.0	202 06.3	48.1	167 44.6	32.2	108 22.9	20.7
	23	260 56.1	211 38.9	10.7	217 07.0	48.6	182 46.4	32.2	123 25.1	20.6
	28 00	275 58.6	226 38.8	N15 11.3	232 07.7	N15 49.1	197 48.3	N22 32.3	138 27.3	N17 20.6
	01	291 01.1	241 38.7	12.0	247 08.4	49.7	212 50.1	32.3	153 29.4	20.5
	02	306 03.5	256 38.6	12.7	262 09.0	50.2	227 52.0	32.4	168 31.6	20.4
	03	321 06.0	271 38.5	·· 13.3	277 09.7	·· 50.8	242 53.8	·· 32.4	183 33.8	·· 20.3
	04	336 08.4	286 38.3	14.0	292 10.4	51.3	257 55.7	32.5	198 36.0	20.2
	05	351 10.9	301 38.2	14.7	307 11.1	51.8	272 57.5	32.5	213 38.2	20.2
	06	6 13.4	316 38.1	N15 15.4	322 11.7	N15 52.4	287 59.4	N22 32.5	228 40.4	N17 20.1
	07	21 15.8	331 38.0	16.0	337 12.4	52.9	303 01.2	32.6	243 42.6	20.0
T	08	36 18.3	346 37.9	16.7	352 13.1	53.5	318 03.1	32.6	258 44.8	19.9
U	09	51 20.8	1 37.8	·· 17.4	7 13.8	·· 54.0	333 04.9	·· 32.7	273 47.0	·· 19.8
E	10	66 23.2	16 37.7	18.0	22 14.4	54.5	348 06.8	32.7	288 49.1	19.8
S	11	81 25.7	31 37.6	18.7	37 15.1	55.1	3 08.6	32.8	303 51.3	19.7
D	12	96 28.2	46 37.5	N15 19.4	52 15.8	N15 55.6	18 10.5	N22 32.8	318 53.5	N17 19.6
A	13	111 30.6	61 37.4	20.0	67 16.5	56.2	33 12.4	32.9	333 55.7	19.5
Y	14	126 33.1	76 37.3	20.7	82 17.1	56.7	48 14.2	32.9	348 57.9	19.4
	15	141 35.5	91 37.1	·· 21.4	97 17.8	·· 57.2	63 16.1	·· 33.0	4 00.1	·· 19.4
	16	156 38.0	106 37.0	22.0	112 18.5	57.8	78 17.9	33.0	19 02.3	19.3
	17	171 40.5	121 36.9	22.7	127 19.2	58.3	93 19.8	33.1	34 04.5	19.2
	18	186 42.9	136 36.8	N15 23.4	142 19.8	N15 58.8	108 21.6	N22 33.1	49 06.7	N17 19.1
	19	201 45.4	151 36.7	24.0	157 20.5	59.4	123 23.5	33.2	64 08.8	19.0
	20	216 47.9	166 36.6	24.7	172 21.2	15 59.9	138 25.3	33.2	79 11.0	19.0
	21	231 50.3	181 36.5	·· 25.4	187 21.9	16 00.4	153 27.2	·· 33.3	94 13.2	·· 18.9
	22	246 52.8	196 36.3	26.0	202 22.5	01.0	168 29.0	33.3	109 15.4	18.8
	23	261 55.3	211 36.2	26.7	217 23.2	01.5	183 30.9	33.4	124 17.6	18.7
	29 00	276 57.7	226 36.1	N15 27.4	232 23.9	N16 02.1	198 32.7	N22 33.4	139 19.8	N17 18.6
	01	292 00.2	241 36.0	28.0	247 24.6	02.6	213 34.6	33.5	154 22.0	18.6
	02	307 02.7	256 35.9	28.7	262 25.2	03.1	228 36.5	33.5	169 24.2	18.5
	03	322 05.1	271 35.7	·· 29.4	277 25.9	·· 03.7	243 38.3	·· 33.6	184 26.3	·· 18.4
	04	337 07.6	286 35.6	30.0	292 26.6	04.2	258 40.2	33.6	199 28.5	18.3
	05	352 10.0	301 35.5	30.7	307 27.3	04.7	273 42.0	33.7	214 30.7	18.2
	06	7 12.5	316 35.4	N15 31.3	322 27.9	N16 05.3	288 43.9	N22 33.7	229 32.9	N17 18.2
W	07	22 15.0	331 35.3	32.0	337 28.6	05.8	303 45.7	33.8	244 35.1	18.1
E	08	37 17.4	346 35.1	32.7	352 29.3	06.3	318 47.6	33.8	259 37.3	18.0
D	09	52 19.9	1 35.0	·· 33.3	7 29.9	·· 06.9	333 49.4	·· 33.9	274 39.5	·· 17.9
N	10	67 22.4	16 34.9	34.0	22 30.6	07.4	348 51.3	33.9	289 41.7	17.8
E	11	82 24.8	31 34.7	34.7	37 31.3	07.9	3 53.1	33.9	304 43.8	17.8
S	12	97 27.3	46 34.6	N15 35.3	52 32.0	N16 08.4	18 55.0	N22 34.0	319 46.0	N17 17.7
D	13	112 29.8	61 34.5	36.0	67 32.6	09.0	33 56.9	34.0	334 48.2	17.6
A	14	127 32.2	76 34.4	36.6	82 33.3	09.5	48 58.7	34.1	349 50.4	17.5
Y	15	142 34.7	91 34.2	·· 37.3	97 34.0	·· 10.0	64 00.6	·· 34.1	4 52.6	·· 17.4
	16	157 37.2	106 34.1	38.0	112 34.7	10.6	79 02.4	34.2	19 54.8	17.4
	17	172 39.6	121 34.0	38.6	127 35.3	11.1	94 04.3	34.2	34 57.0	17.3
	18	187 42.1	136 33.8	N15 39.3	142 36.0	N16 11.6	109 06.1	N22 34.3	49 59.1	N17 17.2
	19	202 44.5	151 33.7	39.9	157 36.7	12.2	124 08.0	34.3	65 01.3	17.1
	20	217 47.0	166 33.6	40.6	172 37.4	12.7	139 09.8	34.4	80 03.5	17.0
	21	232 49.5	181 33.4	·· 41.3	187 38.0	·· 13.2	154 11.7	·· 34.4	95 05.7	·· 17.0
	22	247 51.9	196 33.3	41.9	202 38.7	13.7	169 13.6	34.5	110 07.9	16.9
	23	262 54.4	211 33.2	42.6	217 39.4	14.3	184 15.4	34.5	125 10.1	16.8
	Mer. Pass.	h m 5 35.2	v −0.1	d 0.7	v 0.7	d 0.5	v 1.9	d 0.0	v 2.2	d 0.1

STARS

Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 39.2	S40 23.6
Achernar	335 47.2	S57 20.8
Acrux	173 39.5	S62 58.8
Adhara	255 34.2	S28 56.6
Aldebaran	291 20.8	N16 27.8
Alioth	166 44.4	N56 05.2
Alkaid	153 20.1	N49 25.8
Al Na'ir	28 17.4	S47 03.9
Alnilam	276 14.2	S 1 13.0
Alphard	218 22.9	S 8 33.8
Alphecca	126 33.7	N26 47.6
Alpheratz	358 11.5	N28 57.9
Altair	62 34.3	N 8 48.6
Ankaa	353 42.4	S42 25.4
Antares	112 59.2	S26 22.9
Arcturus	146 20.3	N19 18.1
Atria	108 24.8	S68 59.3
Avior	234 29.6	S59 26.5
Bellatrix	279 01.4	N 6 19.7
Betelgeuse	271 31.0	N 7 24.1
Canopus	264 08.7	S52 41.1
Capella	281 15.0	N45 58.4
Deneb	49 49.5	N45 12.0
Denebola	183 01.3	N14 41.9
Diphda	349 23.1	S18 06.5
Dubhe	194 25.2	N61 52.6
Elnath	278 47.2	N28 35.2
Eltanin	90 58.2	N51 29.7
Enif	34 13.5	N 9 46.4
Fomalhaut	15 53.7	S29 44.3
Gacrux	172 31.0	S56 59.5
Gienah	176 20.2	S17 25.1
Hadar	149 26.0	S60 16.1
Hamal	328 31.5	N23 21.2
Kaus Aust.	84 19.3	S34 23.6
Kochab	137 18.3	N74 15.2
Markab	14 05.2	N15 05.0
Menkar	314 43.6	N 4 00.1
Menkent	148 39.3	S36 15.7
Miaplacidus	221 46.0	S69 37.8
Mirfak	309 19.5	N49 46.7
Nunki	76 31.5	S26 19.4
Peacock	54 01.3	S56 48.2
Pollux	244 01.2	N28 04.8
Procyon	245 28.4	N 5 16.9
Rasalhague	96 31.3	N12 34.7
Regulus	208 12.5	N12 04.6
Rigel	281 38.4	S 8 13.7
Rigil Kent.	140 28.3	S60 44.7
Sabik	102 43.3	S15 41.8
Schedar	350 11.4	N56 24.6
Shaula	96 58.3	S37 05.2
Sirius	258 58.0	S16 41.2
Spica	158 59.7	S11 02.7
Suhail	223 12.7	S43 20.7
Vega	80 56.9	N38 45.9
Zuben'ubi	137 35.2	S15 56.9

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	310 40.2	8 53
Mars	316 09.1	8 31
Jupiter	281 49.7	10 47
Saturn	222 28.7	14 44

G.M.T.		SUN G.H.A.	SUN Dec.	MOON G.H.A.	v	MOON Dec.	d	H.P.
d	h	° ′	° ′	° ′	′	° ′	′	′
27	00	179 17.1	N23 20.2	59 31.9	7.5	S12 38.8	8.7	59.9
	01	194 16.9	20.1	73 58.4	7.4	12 47.5	8.7	59.9
	02	209 16.8	20.0	88 24.8	7.3	12 56.2	8.6	59.9
	03	224 16.7	·· 19.9	102 51.1	7.2	13 04.8	8.5	60.0
	04	239 16.5	19.8	117 17.3	7.2	13 13.3	8.5	60.0
	05	254 16.4	19.7	131 43.5	7.0	13 21.8	8.4	60.0
	06	269 16.3	N23 19.6	146 09.5	7.0	S13 30.2	8.2	60.1
	07	284 16.2	19.5	160 35.5	6.9	13 38.4	8.3	60.1
	08	299 16.0	19.4	175 01.4	6.9	13 46.7	8.1	60.1
MONDAY	09	314 15.9	·· 19.3	189 27.3	6.7	13 54.8	8.0	60.1
	10	329 15.8	19.2	203 53.0	6.7	14 02.8	8.0	60.2
	11	344 15.6	19.1	218 18.7	6.6	14 10.8	7.9	60.2
	12	359 15.5	N23 19.0	232 44.3	6.5	S14 18.7	7.8	60.2
	13	14 15.4	18.9	247 09.8	6.5	14 26.5	7.7	60.2
	14	29 15.2	18.8	261 35.3	6.4	14 34.2	7.6	60.3
	15	44 15.1	·· 18.7	276 00.7	6.3	14 41.8	7.5	60.3
	16	59 15.0	18.6	290 26.0	6.2	14 49.3	7.4	60.3
	17	74 14.9	18.5	304 51.2	6.2	14 56.7	7.3	60.3
	18	89 14.7	N23 18.3	319 16.4	6.0	S15 04.0	7.3	60.4
	19	104 14.6	18.2	333 41.4	6.0	15 11.3	7.1	60.4
	20	119 14.5	18.1	348 06.4	6.0	15 18.4	7.0	60.4
	21	134 14.3	·· 18.0	2 31.4	5.8	15 25.4	7.0	60.4
	22	149 14.2	17.9	16 56.2	5.8	15 32.4	6.8	60.5
	23	164 14.1	17.8	31 21.0	5.7	15 39.2	6.8	60.5
28	00	179 14.0	N23 17.7	45 45.7	5.6	S15 46.0	6.6	60.5
	01	194 13.8	17.6	60 10.3	5.6	15 52.6	6.5	60.5
	02	209 13.7	17.5	74 34.9	5.5	15 59.1	6.5	60.5
	03	224 13.6	·· 17.4	88 59.4	5.4	16 05.6	6.3	60.6
	04	239 13.5	17.2	103 23.8	5.4	16 11.9	6.2	60.6
	05	254 13.3	17.1	117 48.2	5.3	16 18.1	6.1	60.6
	06	269 13.2	N23 17.0	132 12.5	5.2	S16 24.2	6.0	60.6
	07	284 13.1	16.9	146 36.7	5.2	16 30.2	5.9	60.6
	08	299 12.9	16.8	161 00.9	5.1	16 36.1	5.7	60.7
TUESDAY	09	314 12.8	·· 16.7	175 25.0	5.0	16 41.8	5.7	60.7
	10	329 12.7	16.5	189 49.0	5.0	16 47.5	5.5	60.7
	11	344 12.6	16.4	204 13.0	4.9	16 53.0	5.5	60.7
	12	359 12.4	N23 16.3	218 36.9	4.8	S16 58.5	5.3	60.7
	13	14 12.3	16.2	233 00.7	4.8	17 03.8	5.1	60.8
	14	29 12.2	16.1	247 24.5	4.8	17 08.9	5.1	60.8
	15	44 12.1	·· 15.9	261 48.3	4.6	17 14.0	5.0	60.8
	16	59 11.9	15.8	276 11.9	4.6	17 19.0	4.8	60.8
	17	74 11.8	15.7	290 35.5	4.6	17 23.8	4.7	60.8
	18	89 11.7	N23 15.6	304 59.1	4.5	S17 28.5	4.6	60.8
	19	104 11.5	15.5	319 22.6	4.5	17 33.1	4.4	60.8
	20	119 11.4	15.3	333 46.1	4.4	17 37.5	4.4	60.9
	21	134 11.3	·· 15.2	348 09.5	4.3	17 41.9	4.2	60.9
	22	149 11.2	15.1	2 32.8	4.3	17 46.1	4.0	60.9
	23	164 11.0	14.9	16 56.1	4.3	17 50.1	4.0	60.9
29	00	179 10.9	N23 14.8	31 19.4	4.2	S17 54.1	3.8	60.9
	01	194 10.8	14.7	45 42.6	4.1	17 57.9	3.7	60.9
	02	209 10.7	14.6	60 05.7	4.1	18 01.6	3.6	60.9
	03	224 10.5	·· 14.4	74 28.8	4.1	18 05.2	3.4	60.9
	04	239 10.4	14.3	88 51.9	4.1	18 08.6	3.3	61.0
	05	254 10.3	14.2	103 15.0	4.0	18 11.9	3.1	61.0
	06	269 10.2	N23 14.0	117 38.0	3.9	S18 15.0	3.1	61.0
WEDNESDAY	07	284 10.0	13.9	132 00.9	3.9	18 18.1	2.9	61.0
	08	299 09.9	13.8	146 23.8	3.9	18 21.0	2.7	61.0
	09	314 09.8	·· 13.6	160 46.7	3.9	18 23.7	2.7	61.0
	10	329 09.7	13.5	175 09.6	3.8	18 26.4	2.4	61.0
	11	344 09.5	13.4	189 32.4	3.8	18 28.8	2.4	61.0
	12	359 09.4	N23 13.2	203 55.2	3.8	S18 31.2	2.2	61.0
	13	14 09.3	13.1	218 18.0	3.7	18 33.4	2.1	61.0
	14	29 09.2	13.0	232 40.7	3.8	18 35.5	1.9	61.0
	15	44 09.0	·· 12.8	247 03.5	3.7	18 37.4	1.8	61.0
	16	59 08.9	12.7	261 26.2	3.7	18 39.2	1.7	61.0
	17	74 08.8	12.5	275 48.9	3.6	18 40.9	1.5	61.0
	18	89 08.7	N23 12.4	290 11.5	3.7	S18 42.4	1.4	61.0
	19	104 08.5	12.3	304 34.2	3.6	18 43.8	1.3	61.0
	20	119 08.4	12.1	318 56.8	3.6	18 45.1	1.1	61.0
	21	134 08.3	·· 12.0	333 19.4	3.6	18 46.2	0.9	61.0
	22	149 08.2	11.8	347 42.0	3.6	18 47.1	0.9	61.0
	23	164 08.0	11.7	2 04.6	3.6	18 48.0	0.6	61.0
		S.D. 15.8	d 0.1	S.D. 16.4		16.5		16.6

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 27	Moonrise 28	Moonrise 29	Moonrise 30
°	h m	h m	h m	h m	h m	h m	h m
N 72	□	□	□	18 34	21 23	■	■
N 70	□	□	□	17 56	19 52	21 31	22 21
68	□	□	□	17 31	19 12	20 38	21 35
66	□	□	□	17 11	18 45	20 06	21 04
64	////	////	01 36	16 55	18 24	19 42	20 42
62	////	////	02 13	16 42	18 08	19 23	20 23
60	////	00 56	02 39	16 31	17 54	19 08	20 08
N 58	////	01 44	02 59	16 21	17 42	18 55	19 55
56	////	02 14	03 16	16 13	17 31	18 43	19 44
54	00 52	02 36	03 30	16 05	17 22	18 33	19 34
52	01 36	02 54	03 42	15 59	17 14	18 24	19 26
50	02 03	03 09	03 53	15 53	17 07	18 16	19 18
45	02 49	03 38	04 15	15 40	16 51	17 59	19 01
N 40	03 19	04 01	04 33	15 29	16 39	17 46	18 48
35	03 42	04 19	04 48	15 20	16 28	17 34	18 36
30	04 00	04 34	05 01	15 12	16 18	17 24	18 26
20	04 29	04 59	05 23	14 59	16 02	17 06	18 08
N 10	04 52	05 19	05 42	14 47	15 48	16 51	17 53
0	05 11	05 37	05 59	14 36	15 35	16 37	17 39
S 10	05 28	05 54	06 17	14 25	15 22	16 22	17 25
20	05 44	06 11	06 35	14 13	15 08	16 07	17 10
30	06 00	06 30	06 56	14 00	14 52	15 50	16 52
35	06 09	06 41	07 09	13 52	14 43	15 40	16 42
40	06 18	06 52	07 23	13 44	14 32	15 28	16 30
45	06 28	07 06	07 39	13 34	14 20	15 15	16 17
S 50	06 40	07 22	08 00	13 22	14 05	14 58	16 00
52	06 45	07 29	08 10	13 16	13 59	14 51	15 53
54	06 51	07 37	08 21	13 10	13 51	14 42	15 44
56	06 57	07 46	08 33	13 03	13 42	14 32	15 34
58	07 04	07 56	08 48	12 55	13 33	14 21	15 23
S 60	07 11	08 08	09 05	12 47	13 22	14 09	15 10

Lat.	Sunset	Twilight Civil	Twilight Naut.	Moonset 27	Moonset 28	Moonset 29	Moonset 30
°	h m	h m	h m	h m	h m	h m	h m
N 72	□	□	□	22 52	22 08	■	■
N 70	□	□	□	23 30	23 40	24 11	00 11
68	□	□	□	23 57	24 20	00 20	01 03
66	□	□	□	24 18	00 18	00 47	01 35
64	22 29	////	////	00 11	00 34	01 09	01 59
62	21 53	////	////	00 21	00 48	01 26	02 18
60	21 27	23 09	////	00 29	01 00	01 40	02 34
N 58	21 07	22 21	////	00 37	01 10	01 52	02 47
56	20 50	21 52	////	00 44	01 19	02 03	02 59
54	20 36	21 30	23 13	00 50	01 27	02 12	03 09
52	20 24	21 12	22 29	00 55	01 34	02 21	03 18
50	20 13	20 57	22 02	01 00	01 40	02 28	03 26
45	19 51	20 28	21 18	01 11	01 54	02 44	03 43
N 40	19 33	20 06	20 47	01 20	02 05	02 57	03 57
35	19 18	19 48	20 24	01 28	02 15	03 09	04 08
30	19 05	19 32	20 06	01 34	02 24	03 18	04 19
20	18 43	19 08	19 37	01 46	02 38	03 35	04 36
N 10	18 24	18 47	19 14	01 56	02 51	03 50	04 52
0	18 07	18 29	18 56	02 06	03 03	04 04	05 06
S 10	17 50	18 12	18 39	02 16	03 16	04 18	05 21
20	17 31	17 55	18 23	02 26	03 29	04 33	05 36
30	17 10	17 36	18 06	02 38	03 43	04 49	05 53
35	16 58	17 26	17 58	02 45	03 52	04 59	06 04
40	16 44	17 14	17 48	02 52	04 02	05 11	06 15
45	16 27	17 01	17 38	03 01	04 14	05 24	06 29
S 50	16 06	16 45	17 26	03 12	04 28	05 40	06 46
52	15 57	16 37	17 21	03 18	04 34	05 47	06 54
54	15 46	16 29	17 16	03 23	04 41	05 56	07 02
56	15 33	16 20	17 09	03 30	04 50	06 05	07 12
58	15 19	16 10	17 03	03 37	04 59	06 16	07 23
S 60	15 01	15 59	16 55	03 45	05 09	06 28	07 36

Day	SUN Eqn. of Time 00ʰ	SUN Eqn. of Time 12ʰ	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
	m s	m s	h m	h m	h m	d	
27	02 52	02 58	12 03	20 49	08 21	11	
28	03 04	03 10	12 03	21 49	09 19	12	◐
29	03 16	03 22	12 03	22 51	10 20	13	

	G.M.T.	ARIES	VENUS −3.8		MARS +1.2		JUPITER −1.5		SATURN +0.6	
		G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
	d h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
	30 00	277 56.9	226 33.0	N15 43.2	232 40.0	N16 14.8	199 17.3	N22 34.6	140 12.3	N17 16.7
	01	292 59.3	241 32.9	43.9	247 40.7	15.3	214 19.1	34.6	155 14.4	16.6
	02	308 01.8	256 32.8	44.6	262 41.4	15.9	229 21.0	34.7	170 16.6	16.6
	03	323 04.3	271 32.6	·· 45.2	277 42.1	·· 16.4	244 22.8	·· 34.7	185 18.8	·· 16.5
	04	338 06.7	286 32.5	45.9	292 42.7	16.9	259 24.7	34.7	200 21.0	16.4
	05	353 09.2	301 32.3	46.5	307 43.4	17.4	274 26.5	34.8	215 23.2	16.3
	06	8 11.6	316 32.2	N15 47.2	322 44.1	N16 18.0	289 28.4	N22 34.8	230 25.4	N17 16.2
	07	23 14.1	331 32.1	47.8	337 44.8	18.5	304 30.3	34.9	245 27.6	16.1
T	08	38 16.6	346 31.9	48.5	352 45.4	19.0	319 32.1	34.9	260 29.7	16.1
H	09	53 19.0	1 31.8	·· 49.1	7 46.1	·· 19.5	334 34.0	·· 35.0	275 31.9	·· 16.0
U	10	68 21.5	16 31.6	49.8	22 46.8	20.1	349 35.8	35.0	290 34.1	15.9
R	11	83 24.0	31 31.5	50.5	37 47.4	20.6	4 37.7	35.1	305 36.3	15.8
S	12	98 26.4	46 31.3	N15 51.1	52 48.1	N16 21.1	19 39.5	N22 35.1	320 38.5	N17 15.7
D	13	113 28.9	61 31.2	51.8	67 48.8	21.6	34 41.4	35.2	335 40.7	15.7
A	14	128 31.4	76 31.1	52.4	82 49.5	22.2	49 43.2	35.2	350 42.9	15.6
Y	15	143 33.8	91 30.9	·· 53.1	97 50.1	·· 22.7	64 45.1	·· 35.3	5 45.0	·· 15.5
	16	158 36.3	106 30.8	53.7	112 50.8	23.2	79 47.0	35.3	20 47.2	15.4
	17	173 38.8	121 30.6	54.4	127 51.5	23.7	94 48.8	35.4	35 49.4	15.3
	18	188 41.2	136 30.5	N15 55.0	142 52.1	N16 24.3	109 50.7	N22 35.4	50 51.6	N17 15.3
	19	203 43.7	151 30.3	55.7	157 52.8	24.8	124 52.5	35.4	65 53.8	15.2
	20	218 46.1	166 30.2	56.3	172 53.5	25.3	139 54.4	35.5	80 56.0	15.1
	21	233 48.6	181 30.0	·· 57.0	187 54.2	·· 25.8	154 56.2	·· 35.5	95 58.1	·· 15.0
	22	248 51.1	196 29.9	57.6	202 54.8	26.3	169 58.1	35.6	111 00.3	14.9
	23	263 53.5	211 29.7	58.3	217 55.5	26.9	185 00.0	35.6	126 02.5	14.8
	1 00	278 56.0	226 29.6	N15 58.9	232 56.2	N16 27.4	200 01.8	N22 35.7	141 04.7	N17 14.8
	01	293 58.5	241 29.4	15 59.6	247 56.8	27.9	215 03.7	35.7	156 06.9	14.7
	02	309 00.9	256 29.2	16 00.2	262 57.5	28.4	230 05.5	35.8	171 09.1	14.6
	03	324 03.4	271 29.1	·· 00.9	277 58.2	·· 28.9	245 07.4	·· 35.8	186 11.2	·· 14.5
	04	339 05.9	286 28.9	01.5	292 58.9	29.5	260 09.2	35.9	201 13.4	14.4
	05	354 08.3	301 28.8	02.2	307 59.5	30.0	275 11.1	35.9	216 15.6	14.4
	06	9 10.8	316 28.6	N16 02.8	323 00.2	N16 30.5	290 13.0	N22 36.0	231 17.8	N17 14.3
	07	24 13.3	331 28.5	03.5	338 00.9	31.0	305 14.8	36.0	246 20.0	14.2
	08	39 15.7	346 28.3	04.1	353 01.5	31.5	320 16.7	36.0	261 22.2	14.1
F	09	54 18.2	1 28.1	·· 04.8	8 02.2	·· 32.1	335 18.5	·· 36.1	276 24.3	·· 14.0
R	10	69 20.6	16 28.0	05.4	23 02.9	32.6	350 20.4	36.1	291 26.5	14.0
I	11	84 23.1	31 27.8	06.1	38 03.6	33.1	5 22.2	36.2	306 28.7	13.9
D	12	99 25.6	46 27.7	N16 06.7	53 04.2	N16 33.6	20 24.1	N22 36.2	321 30.9	N17 13.8
A	13	114 28.0	61 27.5	07.4	68 04.9	34.1	35 26.0	36.3	336 33.1	13.7
Y	14	129 30.5	76 27.3	08.0	83 05.6	34.6	50 27.8	36.3	351 35.3	13.6
	15	144 33.0	91 27.2	·· 08.7	98 06.2	·· 35.2	65 29.7	·· 36.4	6 37.4	·· 13.5
	16	159 35.4	106 27.0	09.3	113 06.9	35.7	80 31.5	36.4	21 39.6	13.5
	17	174 37.9	121 26.8	10.0	128 07.6	36.2	95 33.4	36.5	36 41.8	13.4
	18	189 40.4	136 26.7	N16 10.6	143 08.3	N16 36.7	110 35.2	N22 36.5	51 44.0	N17 13.3
	19	204 42.8	151 26.5	11.3	158 08.9	37.2	125 37.1	36.5	66 46.2	13.2
	20	219 45.3	166 26.3	11.9	173 09.6	37.7	140 39.0	36.6	81 48.4	13.1
	21	234 47.7	181 26.2	·· 12.5	188 10.3	·· 38.3	155 40.8	·· 36.6	96 50.5	·· 13.0
	22	249 50.2	196 26.0	13.2	203 10.9	38.8	170 42.7	36.7	111 52.7	13.0
	23	264 52.7	211 25.8	13.8	218 11.6	39.3	185 44.5	36.7	126 54.9	12.9
	2 00	279 55.1	226 25.7	N16 14.5	233 12.3	N16 39.8	200 46.4	N22 36.8	141 57.1	N17 12.8
	01	294 57.6	241 25.5	15.1	248 12.9	40.3	215 48.2	36.8	156 59.3	12.7
	02	310 00.1	256 25.3	15.8	263 13.6	40.8	230 50.1	36.9	172 01.4	12.6
	03	325 02.5	271 25.2	·· 16.4	278 14.3	·· 41.3	245 52.0	·· 36.9	187 03.6	·· 12.6
	04	340 05.0	286 25.0	17.0	293 15.0	41.9	260 53.8	36.9	202 05.8	12.5
	05	355 07.5	301 24.8	17.7	308 15.6	42.4	275 55.7	37.0	217 08.0	12.4
	06	10 09.9	316 24.6	N16 18.3	323 16.3	N16 42.9	290 57.5	N22 37.0	232 10.2	N17 12.3
	07	25 12.4	331 24.5	19.0	338 17.0	43.4	305 59.4	37.1	247 12.4	12.2
S	08	40 14.9	346 24.3	19.6	353 17.6	43.9	321 01.3	37.1	262 14.5	12.1
A	09	55 17.3	1 24.1	·· 20.3	8 18.3	·· 44.4	336 03.1	·· 37.2	277 16.7	·· 12.1
T	10	70 19.8	16 23.9	20.9	23 19.0	44.9	351 05.0	37.2	292 18.9	12.0
U	11	85 22.2	31 23.7	21.5	38 19.6	45.4	6 06.8	37.3	307 21.1	11.9
R	12	100 24.7	46 23.6	N16 22.2	53 20.3	N16 45.9	21 08.7	N22 37.3	322 23.3	N17 11.8
D	13	115 27.2	61 23.4	22.8	68 21.0	46.5	36 10.6	37.3	337 25.4	11.7
A	14	130 29.6	76 23.2	23.5	83 21.6	47.0	51 12.4	37.4	352 27.6	11.7
Y	15	145 32.1	91 23.0	·· 24.1	98 22.3	·· 47.5	66 14.3	·· 37.4	7 29.8	·· 11.6
	16	160 34.6	106 22.8	24.7	113 23.0	48.0	81 16.1	37.5	22 32.0	11.5
	17	175 37.0	121 22.7	25.4	128 23.7	48.5	96 18.0	37.5	37 34.2	11.4
	18	190 39.5	136 22.5	N16 26.0	143 24.3	N16 49.0	111 19.8	N22 37.6	52 36.3	N17 11.3
	19	205 42.0	151 22.3	26.6	158 25.0	49.5	126 21.7	37.6	67 38.5	11.2
	20	220 44.4	166 22.1	27.3	173 25.7	50.0	141 23.6	37.7	82 40.7	11.2
	21	235 46.9	181 21.9	·· 27.9	188 26.3	·· 50.5	156 25.4	·· 37.7	97 42.9	·· 11.1
	22	250 49.4	196 21.7	28.6	203 27.0	51.0	171 27.3	37.7	112 45.1	11.0
	23	265 51.8	211 21.5	29.2	218 27.7	51.5	186 29.1	37.8	127 47.3	10.9
	Mer. Pass.	h m 5 23.4	v −0.2	d 0.6	v 0.7	d 0.5	v 1.9	d 0.0	v 2.2	d 0.1

STARS

Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 39.2	S40 23.5
Achernar	335 47.1	S57 20.8
Acrux	173 39.5	S62 58.8
Adhara	255 34.2	S28 56.6
Aldebaran	291 20.8	N16 27.8
Alioth	166 44.5	N56 05.2
Alkaid	153 20.1	N49 25.8
Al Na'ir	28 17.4	S47 03.9
Alnilam	276 14.2	S 1 13.0
Alphard	218 22.9	S 8 33.8
Alphecca	126 33.7	N26 47.6
Alpheratz	358 11.5	N28 57.9
Altair	62 34.3	N 8 48.6
Ankaa	353 42.4	S42 25.4
Antares	112 59.2	S26 22.9
Arcturus	146 20.3	N19 18.1
Atria	108 24.8	S68 59.3
Avior	234 29.6	S59 26.5
Bellatrix	279 01.4	N 6 19.7
Betelgeuse	271 30.9	N 7 24.1
Canopus	264 08.7	S52 41.1
Capella	281 14.9	N45 58.4
Deneb	49 49.5	N45 12.0
Denebola	183 01.3	N14 41.9
Diphda	349 23.1	S18 06.5
Dubhe	194 25.2	N61 52.6
Elnath	278 47.2	N28 35.2
Eltanin	90 58.2	N51 29.7
Enif	34 13.5	N 9 46.4
Fomalhaut	15 53.7	S29 44.3
Gacrux	172 31.0	S56 59.5
Gienah	176 20.2	S17 25.1
Hadar	149 26.0	S60 16.1
Hamal	328 31.5	N23 21.3
Kaus Aust.	84 19.3	S34 23.6
Kochab	137 18.4	N74 15.2
Markab	14 05.2	N15 05.1
Menkar	314 43.6	N 4 00.1
Menkent	148 39.3	S36 15.7
Miaplacidus	221 46.0	S69 37.8
Mirfak	309 19.5	N49 46.7
Nunki	76 31.5	S26 19.4
Peacock	54 01.3	S56 48.2
Pollux	244 01.2	N28 04.8
Procyon	245 28.4	N 5 16.9
Rasalhague	96 31.3	N12 34.7
Regulus	208 12.5	N12 04.6
Rigel	281 38.4	S 8 13.7
Rigil Kent.	140 28.3	S60 44.7
Sabik	102 43.3	S15 41.8
Schedar	350 11.4	N56 24.6
Shaula	96 58.3	S37 05.2
Sirius	258 58.0	S16 41.2
Spica	158 59.7	S11 02.7
Suhail	223 12.7	S43 20.7
Vega	80 56.8	N38 45.9
Zuben'ubi	137 35.2	S15 56.9

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	307 33.6	8 54
Mars	314 00.2	8 28
Jupiter	281 05.8	10 39
Saturn	222 08.7	14 34

1977 JUNE 30, JULY 1, 2 (THURS., FRI., SAT.)

	G.M.T.	SUN		MOON				
		G.H.A.	Dec.	G.H.A.	v	Dec.	d	H.P.
	d h	° ′	° ′	° ′	′	° ′	′	′
	30 00	179 07.9	N23 11.5	16 27.2	3.6	S18 48.6	0.6	61.0
	01	194 07.8	11.4	30 49.8	3.6	18 49.2	0.4	61.0
	02	209 07.7	11.2	45 12.4	3.5	18 49.6	0.2	61.0
	03	224 07.5	·· 11.1	59 34.9	3.6	18 49.8	0.2	61.0
	04	239 07.4	11.0	73 57.5	3.6	18 50.0	0.1	61.0
	05	254 07.3	10.8	88 20.1	3.6	18 49.9	0.1	61.0
	06	269 07.2	N23 10.7	102 42.7	3.6	S18 49.8	0.3	61.0
	07	284 07.1	10.5	117 05.3	3.5	18 49.5	0.5	61.0
T	08	299 06.9	10.4	131 27.8	3.6	18 49.0	0.5	61.0
H	09	314 06.8	·· 10.2	145 50.4	3.7	18 48.5	0.8	61.0
U	10	329 06.7	10.1	160 13.1	3.6	18 47.7	0.8	61.0
R	11	344 06.6	09.9	174 35.7	3.6	18 46.9	1.0	61.0
S	12	359 06.4	N23 09.7	188 58.3	3.7	S18 45.9	1.2	61.0
D	13	14 06.3	09.6	203 21.0	3.6	18 44.7	1.3	61.0
A	14	29 06.2	09.4	217 43.6	3.7	18 43.4	1.4	61.0
Y	15	44 06.1	·· 09.3	232 06.3	3.8	18 42.0	1.5	61.0
	16	59 05.9	09.1	246 29.1	3.7	18 40.5	1.7	61.0
	17	74 05.8	09.0	260 51.8	3.8	18 38.8	1.9	61.0
	18	89 05.7	N23 08.8	275 14.6	3.7	S18 36.9	2.0	61.0
	19	104 05.6	08.7	289 37.3	3.9	18 34.9	2.1	61.0
	20	119 05.5	08.5	304 00.2	3.8	18 32.8	2.2	60.9
	21	134 05.3	·· 08.3	318 23.0	3.9	18 30.6	2.4	60.9
	22	149 05.2	08.2	332 45.9	3.9	18 28.2	2.5	60.9
	23	164 05.1	08.0	347 08.8	4.0	18 25.7	2.7	60.9
	1 00	179 05.0	N23 07.8	1 31.8	3.9	S18 23.0	2.8	60.9
	01	194 04.9	07.7	15 54.7	4.1	18 20.2	2.9	60.9
	02	209 04.7	07.5	30 17.8	4.0	18 17.3	3.1	60.9
	03	224 04.6	·· 07.4	44 40.8	4.1	18 14.2	3.1	60.9
	04	239 04.5	07.2	59 03.9	4.2	18 11.1	3.4	60.8
	05	254 04.4	07.0	73 27.1	4.2	18 07.7	3.4	60.8
	06	269 04.3	N23 06.9	87 50.3	4.2	S18 04.3	3.6	60.8
	07	284 04.1	06.7	102 13.5	4.3	18 00.7	3.7	60.8
	08	299 04.0	06.5	116 36.8	4.4	17 57.0	3.8	60.8
F	09	314 03.9	·· 06.4	131 00.2	4.4	17 53.2	4.0	60.8
R	10	329 03.8	06.2	145 23.6	4.4	17 49.2	4.1	60.7
I	11	344 03.7	06.0	159 47.0	4.5	17 45.1	4.2	60.7
D	12	359 03.5	N23 05.9	174 10.5	4.6	S17 40.9	4.4	60.7
A	13	14 03.4	05.7	188 34.1	4.6	17 36.5	4.4	60.7
Y	14	29 03.3	05.5	202 57.7	4.6	17 32.1	4.6	60.7
	15	44 03.2	·· 05.3	217 21.3	4.8	17 27.5	4.7	60.6
	16	59 03.1	05.2	231 45.1	4.8	17 22.8	4.8	60.6
	17	74 02.9	05.0	246 08.9	4.8	17 18.0	.5.0	60.6
	18	89 02.8	N23 04.8	260 32.7	4.9	S17 13.0	5.1	60.6
	19	104 02.7	04.6	274 56.6	5.0	17 07.9	5.2	60.6
	20	119 02.6	04.5	289 20.6	5.1	17 02.7	5.3	60.5
	21	134 02.5	·· 04.3	303 44.7	5.1	16 57.4	5.4	60.5
	22	149 02.3	04.1	318 08.8	5.1	16 52.0	5.5	60.5
	23	164 02.2	03.9	332 32.9	5.3	16 46.5	5.6	60.5
	2 00	179 02.1	N23 03.8	346 57.2	5.3	S16 40.9	5.8	60.4
	01	194 02.0	03.6	1 21.5	5.4	16 35.1	5.9	60.4
	02	209 01.9	03.4	15 45.9	5.4	16 29.2	5.9	60.4
	03	224 01.7	·· 03.2	30 10.3	5.6	16 23.3	6.1	60.4
	04	239 01.6	03.0	44 34.9	5.6	16 17.2	6.2	60.3
	05	254 01.5	02.8	58 59.5	5.6	16 11.0	6.3	60.3
	06	269 01.4	N23 02.7	73 24.1	5.8	S16 04.7	6.4	60.3
	07	284 01.3	02.5	87 48.9	5.8	15 58.3	6.5	60.3
S	08	299 01.2	02.3	102 13.7	5.9	15 51.8	6.6	60.2
A	09	314 01.0	·· 02.1	116 38.6	6.0	15 45.2	6.7	60.2
T	10	329 00.9	01.9	131 03.6	6.1	15 38.5	6.8	60.2
U	11	344 00.8	01.7	145 28.7	6.1	15 31.7	6.9	60.2
R	12	359 00.7	N23 01.5	159 53.8	6.2	S15 24.8	7.0	60.1
D	13	14 00.6	01.4	174 19.0	6.3	15 17.8	7.1	60.1
A	14	29 00.5	01.2	188 44.3	6.4	15 10.7	7.2	60.1
Y	15	44 00.3	·· 01.0	203 09.7	6.4	15 03.5	7.2	60.0
	16	59 00.2	00.8	217 35.1	6.6	14 56.3	7.4	60.0
	17	74 00.1	00.6	232 00.7	6.6	14 48.9	7.5	60.0
	18	89 00.0	N23 00.4	246 26.3	6.7	S14 41.4	7.5	59.9
	19	103 59.9	00.2	260 52.0	6.7	14 33.9	7.6	59.9
	20	118 59.8	23 00.0	275 17.7	6.9	14 26.3	7.7	59.9
	21	133 59.7	22 59.8	289 43.6	7.0	14 18.6	7.8	59.9
	22	148 59.5	59.6	304 09.6	7.0	14 10.8	7.9	59.8
	23	163 59.4	59.4	318 35.6	7.1	14 02.9	8.0	59.8
		S.D. 15.8	d 0.2	S.D.	16.6	16.5		16.4

Lat.	Twilight		Sunrise	Moonrise			
	Naut.	Civil		30	1	2	3
°	h m	h m	h m	h m	h m	h m	h m
N 72	□	□	□	■	23 28	23 10	23 00
N 70	□	□	□	22 21	22 37	22 42	22 43
68	□	□	□	21 35	22 05	22 21	22 30
66	////	////	00 17	21 04	21 41	22 04	22 18
64	////	////	01 41	20 42	21 22	21 50	22 09
62	////	////	02 16	20 23	21 07	21 38	22 01
60	////	01 03	02 42	20 08	20 54	21 28	21 54
N 58	////	01 48	03 02	19 55	20 43	21 19	21 48
56	////	02 17	03 18	19 44	20 33	21 12	21 42
54	00 58	02 38	03 32	19 34	20 25	21 05	21 37
52	01 40	02 56	03 44	19 26	20 17	20 58	21 33
50	02 06	03 11	03 55	19 18	20 10	20 53	21 28
45	02 50	03 40	04 17	19 01	19 55	20 41	21 20
N 40	03 20	04 02	04 35	18 48	19 43	20 31	21 12
35	03 43	04 20	04 49	18 36	19 32	20 22	21 06
30	04 02	04 35	05 02	18 26	19 23	20 14	21 00
20	04 30	05 00	05 24	18 08	19 07	20 01	20 50
N 10	04 53	05 20	05 43	17 53	18 53	19 50	20 42
0	05 11	05 38	06 00	17 39	18 40	19 39	20 34
S 10	05 28	05 55	06 17	17 25	18 27	19 28	20 26
20	05 44	06 12	06 36	17 10	18 13	19 16	20 17
30	06 00	06 30	06 56	16 52	17 57	19 03	20 07
35	06 09	06 41	07 09	16 42	17 48	18 55	20 01
40	06 18	06 52	07 23	16 30	17 37	18 46	19 55
45	06 28	07 05	07 39	16 17	17 25	18 36	19 47
S 50	06 40	07 21	08 00	16 00	17 10	18 24	19 38
52	06 45	07 29	08 09	15 53	17 03	18 18	19 34
54	06 51	07 37	08 20	15 44	16 55	18 11	19 29
56	06 57	07 45	08 32	15 34	16 46	18 04	19 24
58	07 03	07 55	08 47	15 23	16 36	17 56	19 18
S 60	07 10	08 07	09 04	15 10	16 25	17 47	19 12

Lat.	Sunset	Twilight		Moonset			
		Civil	Naut.	30	1	2	3
°	h m	h m	h m	h m	h m	h m	h m
N 72	□	□	□	■	■	02 32	04 50
N 70	□	□	□	00 11	01 31	03 22	05 17
68	□	□	□	01 03	02 17	03 53	05 37
66	23 41	////	////	01 35	02 47	04 16	05 53
64	22 25	////	////	01 59	03 10	04 35	06 06
62	21 50	////	////	02 18	03 28	04 49	06 17
60	21 25	23 03	////	02 34	03 42	05 02	06 26
N 58	21 05	22 18	////	02 47	03 55	05 13	06 35
56	20 49	21 50	////	02 59	04 06	05 22	06 42
54	20 35	21 29	23 08	03 09	04 16	05 30	06 48
52	20 23	21 11	22 27	03 18	04 24	05 37	06 54
50	20 12	20 57	22 01	03 26	04 32	05 44	06 59
45	19 50	20 28	21 17	03 43	04 48	05 58	07 10
N 40	19 33	20 05	20 47	03 57	05 02	06 10	07 19
35	19 18	19 47	20 24	04 08	05 13	06 20	07 27
30	19 05	19 32	20 06	04 19	05 23	06 29	07 34
20	18 43	19 08	19 37	04 36	05 40	06 43	07 46
N 10	18 25	18 48	19 15	04 52	05 54	06 56	07 56
0	18 07	18 30	18 56	05 06	06 08	07 08	08 05
S 10	17 50	18 13	18 39	05 21	06 22	07 20	08 15
20	17 32	17 56	18 23	05 36	06 37	07 33	08 25
30	17 11	17 37	18 07	05 53	06 53	07 48	08 36
35	16 59	17 27	17 59	06 04	07 03	07 56	08 43
40	16 45	17 15	17 49	06 15	07 14	08 06	08 50
45	16 29	17 02	17 39	06 29	07 27	08 17	08 59
S 50	16 08	16 46	17 28	06 46	07 43	08 30	09 09
52	15 58	16 39	17 23	06 54	07 50	08 36	09 14
54	15 48	16 31	17 17	07 02	07 58	08 43	09 19
56	15 35	16 22	17 11	07 12	08 07	08 51	09 25
58	15 21	16 12	17 05	07 23	08 17	08 59	09 32
S 60	15 04	16 01	16 57	07 36	08 29	09 09	09 39

Day	SUN			MOON			
	Eqn. of Time 00ʰ	Eqn. of Time 12ʰ	Mer. Pass.	Mer. Pass. Upper	Mer. Pass. Lower	Age	Phase
	m s	m s	h m	h m	h m	d	
30	03 28	03 34	12 04	23 54	11 23	14	
1	03 40	03 46	12 04	24 54	12 24	15	○
2	03 51	03 57	12 04	00 54	13 24	16	

1977 JULY 3, 4, 5 (SUN., MON., TUES.)

G.M.T.		ARIES	VENUS −3.8		MARS +1.2		JUPITER −1.5		SATURN +0.6	
		G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
d	h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
3	00	280 54.3	226 21.4	N16 29.8	233 28.4	N16 52.1	201 31.0	N22 37.8	142 49.5	N17 10.8
	01	295 56.7	241 21.2	30.4	248 29.0	52.6	216 32.9	37.8	157 51.6	10.7
	02	310 59.2	256 21.0	31.1	263 29.7	53.1	231 34.7	37.9	172 53.8	10.7
	03	326 01.7	271 20.8	·· 31.7	278 30.4	·· 53.6	246 36.6	·· 37.9	187 56.0	·· 10.6
	04	341 04.1	286 20.6	32.4	293 31.0	54.1	261 38.4	38.0	202 58.2	10.5
	05	356 06.6	301 20.4	33.0	308 31.7	54.6	276 40.3	38.0	218 00.4	10.4
	06	11 09.1	316 20.2	N16 33.6	323 32.4	N16 55.1	291 42.2	N22 38.1	233 02.5	N17 10.3
	07	26 11.5	331 20.0	34.3	338 33.0	55.6	306 44.0	38.1	248 04.7	10.2
	08	41 14.0	346 19.8	34.9	353 33.7	56.1	321 45.9	38.2	263 06.9	10.2
S	09	56 16.5	1 19.6	·· 35.5	8 34.4	·· 56.6	336 47.7	·· 38.2	278 09.1	·· 10.1
U	10	71 18.9	16 19.4	36.1	23 35.0	57.1	351 49.6	38.2	293 11.3	10.0
N	11	86 21.4	31 19.3	36.8	38 35.7	57.6	6 51.5	38.3	308 13.4	09.9
D	12	101 23.8	46 19.1	N16 37.4	53 36.4	N16 58.1	21 53.3	N22 38.3	323 15.6	N17 09.8
A	13	116 26.3	61 18.9	38.0	68 37.1	58.6	36 55.2	38.4	338 17.8	09.7
Y	14	131 28.8	76 18.7	38.7	83 37.7	59.1	51 57.0	38.4	353 20.0	09.7
	15	146 31.2	91 18.5	·· 39.3	98 38.4	16 59.6	66 58.9	·· 38.5	8 22.2	·· 09.6
	16	161 33.7	106 18.3	39.9	113 39.1	17 00.1	82 00.8	38.5	23 24.3	09.5
	17	176 36.2	121 18.1	40.6	128 39.7	00.6	97 02.6	38.6	38 26.5	09.4
	18	191 38.6	136 17.9	N16 41.2	143 40.4	N17 01.1	112 04.5	N22 38.6	53 28.7	N17 09.3
	19	206 41.1	151 17.7	41.8	158 41.1	01.6	127 06.3	38.6	68 30.9	09.2
	20	221 43.6	166 17.5	42.5	173 41.7	02.1	142 08.2	38.7	83 33.1	09.2
	21	236 46.0	181 17.3	·· 43.1	188 42.4	·· 02.6	157 10.1	·· 38.7	98 35.2	·· 09.1
	22	251 48.5	196 17.1	43.7	203 43.1	03.1	172 11.9	38.8	113 37.4	09.0
	23	266 51.0	211 16.9	44.3	218 43.7	03.6	187 13.8	38.8	128 39.6	08.9
4	00	281 53.4	226 16.6	N16 45.0	233 44.4	N17 04.1	202 15.6	N22 38.9	143 41.8	N17 08.8
	01	296 55.9	241 16.4	45.6	248 45.1	04.6	217 17.5	38.9	158 43.9	08.7
	02	311 58.3	256 16.2	46.2	263 45.7	05.1	232 19.4	38.9	173 46.1	08.7
	03	327 00.8	271 16.0	·· 46.8	278 46.4	·· 05.6	247 21.2	·· 39.0	188 48.3	·· 08.6
	04	342 03.3	286 15.8	47.5	293 47.1	06.1	262 23.1	39.0	203 50.5	08.5
	05	357 05.7	301 15.6	48.1	308 47.7	06.6	277 24.9	39.1	218 52.7	08.4
	06	12 08.2	316 15.4	N16 48.7	323 48.4	N17 07.1	292 26.8	N22 39.1	233 54.8	N17 08.3
	07	27 10.7	331 15.2	49.3	338 49.1	07.6	307 28.7	39.2	248 57.0	08.2
	08	42 13.1	346 15.0	50.0	353 49.7	08.1	322 30.5	39.2	263 59.2	08.2
M	09	57 15.6	1 14.8	·· 50.6	8 50.4	·· 08.6	337 32.4	·· 39.2	279 01.4	·· 08.1
O	10	72 18.1	16 14.6	51.2	23 51.1	09.1	352 34.3	39.3	294 03.6	08.0
N	11	87 20.5	31 14.4	51.8	38 51.8	09.6	7 36.1	39.3	309 05.7	07.9
D	12	102 23.0	46 14.1	N16 52.5	53 52.4	N17 10.1	22 38.0	N22 39.4	324 07.9	N17 07.8
A	13	117 25.5	61 13.9	53.1	68 53.1	10.6	37 39.8	39.4	339 10.1	07.7
Y	14	132 27.9	76 13.7	53.7	83 53.8	11.1	52 41.7	39.5	354 12.3	07.7
	15	147 30.4	91 13.5	·· 54.3	98 54.4	·· 11.6	67 43.6	·· 39.5	9 14.4	·· 07.6
	16	162 32.8	106 13.3	54.9	113 55.1	12.1	82 45.4	39.5	24 16.6	07.5
	17	177 35.3	121 13.1	55.6	128 55.8	12.6	97 47.3	39.6	39 18.8	07.4
	18	192 37.8	136 12.9	N16 56.2	143 56.4	N17 13.1	112 49.1	N22 39.6	54 21.0	N17 07.3
	19	207 40.2	151 12.6	56.8	158 57.1	13.6	127 51.0	39.7	69 23.2	07.2
	20	222 42.7	166 12.4	57.4	173 57.8	14.1	142 52.9	39.7	84 25.3	07.1
	21	237 45.2	181 12.2	·· 58.0	188 58.4	·· 14.6	157 54.7	·· 39.8	99 27.5	·· 07.1
	22	252 47.6	196 12.0	58.6	203 59.1	15.1	172 56.6	39.8	114 29.7	07.0
	23	267 50.1	211 11.8	59.3	218 59.8	15.6	187 58.5	39.8	129 31.9	06.9
5	00	282 52.6	226 11.5	N16 59.9	234 00.4	N17 16.1	203 00.3	N22 39.9	144 34.0	N17 06.8
	01	297 55.0	241 11.3	17 00.5	249 01.1	16.5	218 02.2	39.9	159 36.2	06.7
	02	312 57.5	256 11.1	01.1	264 01.8	17.0	233 04.0	40.0	174 38.4	06.6
	03	327 59.9	271 10.9	·· 01.7	279 02.4	·· 17.5	248 05.9	·· 40.0	189 40.6	·· 06.6
	04	343 02.4	286 10.7	02.3	294 03.1	18.0	263 07.8	40.0	204 42.8	06.5
	05	358 04.9	301 10.4	03.0	309 03.8	18.5	278 09.6	40.1	219 44.9	06.4
	06	13 07.3	316 10.2	N17 03.6	324 04.4	N17 19.0	293 11.5	N22 40.1	234 47.1	N17 06.3
	07	28 09.8	331 10.0	04.2	339 05.1	19.5	308 13.4	40.2	249 49.3	06.2
T	08	43 12.3	346 09.8	04.8	354 05.8	20.0	323 15.2	40.2	264 51.5	06.1
U	09	58 14.7	1 09.5	·· 05.4	9 06.5	·· 20.5	338 17.1	·· 40.3	279 53.6	·· 06.1
E	10	73 17.2	16 09.3	06.0	24 07.1	21.0	353 18.9	40.3	294 55.8	06.0
S	11	88 19.7	31 09.1	06.6	39 07.8	21.5	8 20.8	40.3	309 58.0	05.9
D	12	103 22.1	46 08.8	N17 07.3	54 08.5	N17 21.9	23 22.7	N22 40.4	325 00.2	N17 05.8
A	13	118 24.6	61 08.6	07.9	69 09.1	22.4	38 24.5	40.4	340 02.3	05.7
Y	14	133 27.1	76 08.4	08.5	84 09.8	22.9	53 26.4	40.5	355 04.5	05.6
	15	148 29.5	91 08.2	·· 09.1	99 10.5	·· 23.4	68 28.3	·· 40.5	10 06.7	·· 05.5
	16	163 32.0	106 07.9	09.7	114 11.1	23.9	83 30.1	40.5	25 08.9	05.5
	17	178 34.4	121 07.7	10.3	129 11.8	24.4	98 32.0	40.6	40 11.0	05.4
	18	193 36.9	136 07.5	N17 10.9	144 12.5	N17 24.9	113 33.8	N22 40.6	55 13.2	N17 05.3
	19	208 39.4	151 07.2	11.5	159 13.1	25.4	128 35.7	40.7	70 15.4	05.2
	20	223 41.8	166 07.0	12.1	174 13.8	25.8	143 37.6	40.7	85 17.6	05.1
	21	238 44.3	181 06.8	·· 12.7	189 14.5	·· 26.3	158 39.4	·· 40.8	100 19.8	·· 05.0
	22	253 46.8	196 06.5	13.4	204 15.1	26.8	173 41.3	40.8	115 21.9	05.0
	23	268 49.2	211 06.3	14.0	219 15.8	27.3	188 43.2	40.8	130 24.1	04.9
Mer. Pass.		h m 5 11.6	v −0.2	d 0.6	v 0.7	d 0.5	v 1.9	d 0.0	v 2.2	d 0.1

STARS		
Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 39.1	S40 23.5
Achernar	335 47.1	S57 20.8
Acrux	173 39.6	S62 58.8
Adhara	255 34.2	S28 56.6
Aldebaran	291 20.8	N16 27.8
Alioth	166 44.5	N56 05.2
Alkaid	153 20.1	N49 25.8
Al Na'ir	28 17.4	S47 03.9
Alnilam	276 14.2	S 1 13.0
Alphard	218 22.9	S 8 33.8
Alphecca	126 33.7	N26 47.6
Alpheratz	358 11.4	N28 57.9
Altair	62 34.3	N 8 48.7
Ankaa	353 42.4	S42 25.4
Antares	112 59.2	S26 22.9
Arcturus	146 20.3	N19 18.1
Atria	108 24.8	S68 59.3
Avior	234 29.6	S59 26.5
Bellatrix	279 01.4	N 6 19.7
Betelgeuse	271 30.9	N 7 24.1
Canopus	264 08.7	S52 41.1
Capella	281 14.9	N45 58.4
Deneb	49 49.5	N45 12.0
Denebola	183 01.3	N14 41.9
Diphda	349 23.0	S18 06.4
Dubhe	194 25.2	N61 52.6
Elnath	278 47.2	N28 35.2
Eltanin	90 58.2	N51 29.7
Enif	34 13.4	N 9 46.4
Fomalhaut	15 53.6	S29 44.2
Gacrux	172 31.1	S56 59.5
Gienah	176 20.2	S17 25.1
Hadar	149 26.1	S60 16.1
Hamal	328 31.4	N23 21.3
Kaus Aust.	84 19.3	S34 23.6
Kochab	137 18.4	N74 15.2
Markab	14 05.1	N15 05.1
Menkar	314 43.6	N 4 00.1
Menkent	148 39.4	S36 15.7
Miaplacidus	221 46.0	S69 37.8
Mirfak	309 19.4	N49 46.7
Nunki	76 31.5	S26 19.4
Peacock	54 01.3	S56 48.2
Pollux	244 01.2	N28 04.8
Procyon	245 28.4	N 5 16.9
Rasalhague	96 31.3	N12 34.7
Regulus	208 12.5	N12 04.6
Rigel	281 38.4	S 8 13.7
Rigil Kent.	140 28.3	S60 44.7
Sabik	102 43.3	S15 41.8
Schedar	350 11.3	N56 24.6
Shaula	96 58.3	S37 05.2
Sirius	258 57.9	S16 41.2
Spica	158 59.7	S11 02.7
Suhail	223 12.7	S43 20.7
Vega	80 56.8	N38 45.9
Zuben'ubi	137 35.2	S15 56.9

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	304 23.2	8 55
Mars	311 51.0	8 25
Jupiter	280 22.2	10 30
Saturn	221 48.4	14 23

	G.M.T.	SUN G.H.A.	SUN Dec.	MOON G.H.A.	MOON v	MOON Dec.	MOON d	MOON H.P.
	d h	° ′	° ′	° ′	′	° ′	′	′
	3 00	178 59.3	N22 59.3	333 01.7	7.2	S13 54.9	8.0	59.8
	01	193 59.2	59.1	347 27.9	7.3	13 46.9	8.2	59.7
	02	208 59.1	58.9	1 54.2	7.3	13 38.7	8.2	59.7
	03	223 59.0	· · 58.7	16 20.5	7.5	13 30.5	8.2	59.7
	04	238 58.9	58.5	30 47.0	7.5	13 22.3	8.4	59.6
	05	253 58.7	58.3	45 13.5	7.6	13 13.9	8.4	59.6
	06	268 58.6	N22 58.1	59 40.1	7.7	S13 05.5	8.5	59.6
	07	283 58.5	57.9	74 06.8	7.8	12 57.0	8.6	59.5
	08	298 58.4	57.7	88 33.6	7.9	12 48.4	8.6	59.5
S	09	313 58.3	· · 57.5	103 00.5	7.9	12 39.8	8.7	59.5
U	10	328 58.2	57.3	117 27.4	8.0	12 31.1	8.8	59.4
N	11	343 58.0	57.1	131 54.4	8.2	12 22.3	8.8	59.4
D	12	358 57.9	N22 56.9	146 21.6	8.2	S12 13.5	8.9	59.3
A	13	13 57.8	56.7	160 48.8	8.2	12 04.6	9.0	59.3
Y	14	28 57.7	56.4	175 16.0	8.4	11 55.6	9.0	59.3
	15	43 57.6	· · 56.2	189 43.4	8.5	11 46.6	9.1	59.2
	16	58 57.5	56.0	204 10.9	8.5	11 37.5	9.1	59.2
	17	73 57.4	55.8	218 38.4	8.6	11 28.4	9.2	59.2
	18	88 57.2	N22 55.6	233 06.0	8.7	S11 19.2	9.2	59.1
	19	103 57.1	55.4	247 33.7	8.8	11 10.0	9.4	59.1
	20	118 57.0	55.2	262 01.5	8.9	11 00.6	9.3	59.1
	21	133 56.9	· · 55.0	276 29.4	8.9	10 51.3	9.4	59.0
	22	148 56.8	54.8	290 57.3	9.1	10 41.9	9.5	59.0
	23	163 56.7	54.6	305 25.4	9.1	10 32.4	9.5	58.9
	4 00	178 56.6	N22 54.4	319 53.5	9.2	S10 22.9	9.5	58.9
	01	193 56.4	54.1	334 21.7	9.3	10 13.4	9.6	58.9
	02	208 56.3	53.9	348 50.0	9.3	10 03.8	9.7	58.8
	03	223 56.2	· · 53.7	3 18.3	9.4	9 54.1	9.7	58.8
	04	238 56.1	53.5	17 46.7	9.6	9 44.4	9.7	58.8
	05	253 56.0	53.3	32 15.3	9.6	9 34.7	9.8	58.7
	06	268 55.9	N22 53.1	46 43.9	9.6	S 9 24.9	9.8	58.7
	07	283 55.8	52.9	61 12.5	9.8	9 15.1	9.8	58.6
	08	298 55.7	52.6	75 41.3	9.8	9 05.3	9.9	58.6
M	09	313 55.6	· · 52.4	90 10.1	9.9	8 55.4	9.9	58.6
O	10	328 55.4	52.2	104 39.0	10.0	8 45.5	10.0	58.5
N	11	343 55.3	52.0	119 08.0	10.0	8 35.5	10.0	58.5
D	12	358 55.2	N22 51.8	133 37.0	10.2	S 8 25.5	10.0	58.4
A	13	13 55.1	51.5	148 06.2	10.2	8 15.5	10.1	58.4
Y	14	28 55.0	51.3	162 35.4	10.3	8 05.4	10.1	58.4
	15	43 54.9	· · 51.1	177 04.7	10.3	7 55.3	10.1	58.3
	16	58 54.8	50.9	191 34.0	10.5	7 45.2	10.1	58.3
	17	73 54.7	50.7	206 03.5	10.5	7 35.1	10.2	58.3
	18	88 54.6	N22 50.4	220 33.0	10.5	S 7 24.9	10.2	58.2
	19	103 54.4	50.2	235 02.5	10.7	7 14.7	10.2	58.2
	20	118 54.3	50.0	249 32.2	10.7	7 04.5	10.3	58.1
	21	133 54.2	· · 49.8	264 01.9	10.8	6 54.2	10.2	58.1
	22	148 54.1	49.5	278 31.7	10.8	6 44.0	10.3	58.1
	23	163 54.0	49.3	293 01.5	11.0	6 33.7	10.3	58.0
	5 00	178 53.9	N22 49.1	307 31.5	11.0	S 6 23.4	10.4	58.0
	01	193 53.8	48.8	322 01.5	11.0	6 13.0	10.3	57.9
	02	208 53.7	48.6	336 31.5	11.1	6 02.7	10.4	57.9
	03	223 53.6	· · 48.4	351 01.6	11.2	5 52.3	10.3	57.9
	04	238 53.5	48.1	5 31.8	11.3	5 42.0	10.4	57.8
	05	253 53.4	47.9	20 02.1	11.3	5 31.6	10.4	57.8
	06	268 53.2	N22 47.7	34 32.4	11.4	S 5 21.2	10.5	57.7
	07	283 53.1	47.4	49 02.8	11.4	5 10.7	10.4	57.7
	08	298 53.0	47.2	63 33.2	11.6	5 00.3	10.4	57.7
T	09	313 52.9	· · 47.0	78 03.8	11.5	4 49.9	10.5	57.6
U	10	328 52.8	46.7	92 34.3	11.7	4 39.4	10.5	57.6
E	11	343 52.7	46.5	107 05.0	11.6	4 28.9	10.4	57.5
S	12	358 52.6	N22 46.3	121 35.6	11.8	S 4 18.5	10.5	57.5
D	13	13 52.5	46.0	136 06.4	11.8	4 08.0	10.5	57.5
A	14	28 52.4	45.8	150 37.2	11.9	3 57.5	10.5	57.4
Y	15	43 52.3	· · 45.6	165 08.1	11.9	3 47.0	10.5	57.4
	16	58 52.2	45.3	179 39.0	12.0	3 36.5	10.5	57.4
	17	73 52.1	45.1	194 10.0	12.0	3 26.0	10.5	57.3
	18	88 52.0	N22 44.8	208 41.0	12.1	S 3 15.5	10.5	57.3
	19	103 51.9	44.6	223 12.1	12.2	3 05.0	10.4	57.2
	20	118 51.7	44.4	237 43.3	12.2	2 54.6	10.5	57.2
	21	133 51.6	· · 44.1	252 14.5	12.2	2 44.1	10.5	57.2
	22	148 51.5	43.9	266 45.7	12.3	2 33.6	10.5	57.1
	23	163 51.4	43.6	281 17.0	12.4	2 23.1	10.5	57.1
		S.D. 15.8	*d* 0.2	S.D. 16.2		15.9		15.7

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 3	Moonrise 4	Moonrise 5	Moonrise 6
°	h m	h m	h m	h m	h m	h m	h m
N 72	▭	▭	▭	23 00	22 53	22 46	22 40
N 70	▭	▭	▭	22 43	22 43	22 43	22 42
68	▭	▭	▭	22 30	22 36	22 40	22 44
66	////	////	00 40	22 18	22 29	22 37	22 45
64	////	////	01 47	22 09	22 23	22 35	22 46
62	////	////	02 21	22 01	22 19	22 34	22 47
60	////	01 10	02 45	21 54	22 14	22 32	22 48
N 58	////	01 53	03 05	21 48	22 11	22 31	22 49
56	////	02 20	03 21	21 42	22 07	22 29	22 50
54	01 05	02 41	03 34	21 37	22 04	22 28	22 51
52	01 44	02 58	03 46	21 33	22 02	22 27	22 51
50	02 09	03 13	03 57	21 28	21 59	22 26	22 52
45	02 53	03 42	04 19	21 20	21 54	22 24	22 53
N 40	03 22	04 04	04 36	21 12	21 49	22 23	22 54
35	03 45	04 21	04 51	21 06	21 45	22 21	22 55
30	04 03	04 36	05 04	21 00	21 42	22 20	22 56
20	04 31	05 01	05 25	20 50	21 36	22 18	22 58
N 10	04 54	05 21	05 44	20 42	21 30	22 16	22 59
0	05 12	05 38	06 01	20 34	21 25	22 14	23 00
S 10	05 29	05 55	06 18	20 26	21 20	22 12	23 02
20	05 44	06 12	06 36	20 17	21 15	22 10	23 03
30	06 00	06 30	06 56	20 07	21 09	22 08	23 05
35	06 09	06 40	07 08	20 01	21 05	22 07	23 06
40	06 18	06 52	07 22	19 55	21 01	22 05	23 07
45	06 28	07 05	07 39	19 47	20 57	22 04	23 08
S 50	06 39	07 20	07 59	19 38	20 51	22 02	23 09
52	06 44	07 28	08 08	19 34	20 49	22 01	23 10
54	06 50	07 36	08 19	19 29	20 46	22 00	23 11
56	06 56	07 44	08 31	19 24	20 43	21 59	23 12
58	07 02	07 54	08 45	19 18	20 39	21 57	23 13
S 60	07 09	08 05	09 02	19 12	20 35	21 56	23 14

Lat.	Sunset	Twilight Civil	Twilight Naut.	Moonset 3	Moonset 4	Moonset 5	Moonset 6
°	h m	h m	h m	h m	h m	h m	h m
N 72	▭	▭	▭	04 50	06 52	08 45	10 30
N 70	▭	▭	▭	05 17	07 07	08 52	10 31
68	▭	▭	▭	05 37	07 20	08 58	10 32
66	23 23	////	////	05 53	07 30	09 03	10 32
64	22 20	////	////	06 06	07 38	09 07	10 33
62	21 47	////	////	06 17	07 45	09 11	10 33
60	21 22	22 56	////	06 26	07 51	09 14	10 33
N 58	21 03	22 15	////	06 35	07 57	09 17	10 33
56	20 47	21 47	////	06 42	08 01	09 19	10 34
54	20 34	21 27	23 02	06 48	08 06	09 21	10 34
52	20 22	21 10	22 24	06 54	08 09	09 23	10 34
50	20 11	20 55	21 58	06 59	08 13	09 25	10 34
45	19 50	20 27	21 15	07 10	08 21	09 29	10 35
N 40	19 32	20 05	20 46	07 19	08 27	09 32	10 35
35	19 18	19 47	20 23	07 27	08 32	09 35	10 35
30	19 05	19 32	20 05	07 34	08 37	09 37	10 35
20	18 44	19 08	19 37	07 46	08 45	09 42	10 36
N 10	18 25	18 48	19 15	07 56	08 52	09 45	10 36
0	18 08	18 30	18 57	08 05	08 59	09 49	10 36
S 10	17 51	18 14	18 40	08 15	09 05	09 52	10 37
20	17 33	17 57	18 24	08 25	09 12	09 56	10 37
30	17 12	17 39	18 08	08 36	09 20	10 00	10 37
35	17 00	17 28	18 00	08 43	09 25	10 02	10 37
40	16 47	17 17	17 51	08 50	09 30	10 05	10 37
45	16 30	17 04	17 41	08 59	09 35	10 08	10 38
S 50	16 10	16 48	17 30	09 09	09 42	10 11	10 38
52	16 01	16 41	17 25	09 14	09 46	10 13	10 38
54	15 50	16 33	17 19	09 19	09 49	10 15	10 38
56	15 38	16 25	17 13	09 25	09 53	10 17	10 38
58	15 24	16 15	17 07	09 32	09 57	10 19	10 38
S 60	15 07	16 04	17 00	09 39	10 02	10 21	10 38

Day	SUN Eqn. of Time 00ʰ	SUN Eqn. of Time 12ʰ	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
	m s	m s	h m	h m	h m	d	
3	04 02	04 08	12 04	01 52	14 20	17	◑
4	04 14	04 19	12 04	02 46	15 12	18	
5	04 24	04 29	12 04	03 37	16 01	19	

1977 JULY 6, 7, 8 (WED., THURS., FRI.)

	G.M.T.	ARIES	VENUS −3.7		MARS +1.2		JUPITER −1.5		SATURN +0.7	
		G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
d	h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
6	00	283 51.7	226 06.0	N17 14.6	234 16.5	N17 27.8	203 45.0	N22 40.9	145 26.3	N17 04.8
	01	298 54.2	241 05.8	15.2	249 17.1	28.3	218 46.9	40.9	160 28.5	04.7
	02	313 56.6	256 05.6	15.8	264 17.8	28.8	233 48.8	41.0	175 30.6	04.6
	03	328 59.1	271 05.3	·· 16.4	279 18.5	·· 29.2	248 50.6	·· 41.0	190 32.8	·· 04.5
	04	344 01.6	286 05.1	17.0	294 19.1	29.7	263 52.5	41.0	205 35.0	04.4
	05	359 04.0	301 04.9	17.6	309 19.8	30.2	278 54.3	41.1	220 37.2	04.4
	06	14 06.5	316 04.6	N17 18.2	324 20.5	N17 30.7	293 56.2	N22 41.1	235 39.3	N17 04.3
W	07	29 08.9	331 04.4	18.8	339 21.1	31.2	308 58.1	41.2	250 41.5	04.2
E	08	44 11.4	346 04.1	19.4	354 21.8	31.7	323 59.9	41.2	265 43.7	04.1
D	09	59 13.9	1 03.9	·· 20.0	9 22.5	·· 32.1	339 01.8	·· 41.2	280 45.9	·· 04.0
N	10	74 16.3	16 03.6	20.6	24 23.1	32.6	354 03.7	41.3	295 48.0	03.9
E	11	89 18.8	31 03.4	21.2	39 23.8	33.1	9 05.5	41.3	310 50.2	03.9
S	12	104 21.3	46 03.2	N17 21.8	54 24.5	N17 33.6	24 07.4	N22 41.4	325 52.4	N17 03.8
D	13	119 23.7	61 02.9	22.4	69 25.1	34.1	39 09.3	41.4	340 54.6	03.7
A	14	134 26.2	76 02.7	23.0	84 25.8	34.6	54 11.1	41.4	355 56.7	03.6
Y	15	149 28.7	91 02.4	·· 23.6	99 26.5	·· 35.0	69 13.0	·· 41.5	10 58.9	·· 03.5
	16	164 31.1	106 02.2	24.2	114 27.1	35.5	84 14.9	41.5	26 01.1	03.4
	17	179 33.6	121 01.9	24.8	129 27.8	36.0	99 16.7	41.6	41 03.3	03.3
	18	194 36.0	136 01.7	N17 25.4	144 28.5	N17 36.5	114 18.6	N22 41.6	56 05.4	N17 03.3
	19	209 38.5	151 01.4	26.0	159 29.1	37.0	129 20.5	41.6	71 07.6	03.2
	20	224 41.0	166 01.2	26.6	174 29.8	37.4	144 22.3	41.7	86 09.8	03.1
	21	239 43.4	181 00.9	·· 27.2	189 30.5	·· 37.9	159 24.2	·· 41.7	101 12.0	·· 03.0
	22	254 45.9	196 00.7	27.8	204 31.1	38.4	174 26.0	41.8	116 14.1	02.9
	23	269 48.4	211 00.4	28.4	219 31.8	38.9	189 27.9	41.8	131 16.3	02.8
7	00	284 50.8	226 00.2	N17 29.0	234 32.5	N17 39.4	204 29.8	N22 41.8	146 18.5	N17 02.7
	01	299 53.3	240 59.9	29.6	249 33.1	39.8	219 31.6	41.9	161 20.7	02.7
	02	314 55.8	255 59.7	30.2	264 33.8	40.3	234 33.5	41.9	176 22.8	02.6
	03	329 58.2	270 59.4	·· 30.8	279 34.5	·· 40.8	249 35.4	·· 42.0	191 25.0	·· 02.5
	04	345 00.7	285 59.1	31.4	294 35.1	41.3	264 37.2	42.0	206 27.2	02.4
	05	0 03.2	300 58.9	32.0	309 35.8	41.7	279 39.1	42.0	221 29.3	02.3
	06	15 05.6	315 58.6	N17 32.6	324 36.5	N17 42.2	294 41.0	N22 42.1	236 31.5	N17 02.2
	07	30 08.1	330 58.4	33.2	339 37.1	42.7	309 42.8	42.1	251 33.7	02.1
T	08	45 10.5	345 58.1	33.7	354 37.8	43.2	324 44.7	42.2	266 35.9	02.1
H	09	60 13.0	0 57.9	·· 34.3	9 38.5	·· 43.6	339 46.6	·· 42.2	281 38.0	·· 02.0
U	10	75 15.5	15 57.6	34.9	24 39.1	44.1	354 48.4	42.2	296 40.2	01.9
R	11	90 17.9	30 57.3	35.5	39 39.8	44.6	9 50.3	42.3	311 42.4	01.8
S	12	105 20.4	45 57.1	N17 36.1	54 40.5	N17 45.1	24 52.2	N22 42.3	326 44.6	N17 01.7
D	13	120 22.9	60 56.8	36.7	69 41.1	45.5	39 54.0	42.4	341 46.7	01.6
A	14	135 25.3	75 56.5	37.3	84 41.8	46.0	54 55.9	42.4	356 48.9	01.5
Y	15	150 27.8	90 56.3	·· 37.9	99 42.5	·· 46.5	69 57.8	·· 42.4	11 51.1	·· 01.5
	16	165 30.3	105 56.0	38.5	114 43.1	47.0	84 59.6	42.5	26 53.3	01.4
	17	180 32.7	120 55.8	39.1	129 43.8	47.4	100 01.5	42.5	41 55.4	01.3
	18	195 35.2	135 55.5	N17 39.6	144 44.5	N17 47.9	115 03.4	N22 42.6	56 57.6	N17 01.2
	19	210 37.7	150 55.2	40.2	159 45.1	48.4	130 05.2	42.6	71 59.8	01.1
	20	225 40.1	165 55.0	40.8	174 45.8	48.9	145 07.1	42.6	87 01.9	01.0
	21	240 42.6	180 54.7	·· 41.4	189 46.5	·· 49.3	160 09.0	·· 42.7	102 04.1	·· 00.9
	22	255 45.0	195 54.4	42.0	204 47.1	49.8	175 10.8	42.7	117 06.3	00.9
	23	270 47.5	210 54.2	42.6	219 47.8	50.3	190 12.7	42.7	132 08.5	00.8
8	00	285 50.0	225 53.9	N17 43.2	234 48.5	N17 50.7	205 14.6	N22 42.8	147 10.6	N17 00.7
	01	300 52.4	240 53.6	43.7	249 49.1	51.2	220 16.4	42.8	162 12.8	00.6
	02	315 54.9	255 53.3	44.3	264 49.8	51.7	235 18.3	42.9	177 15.0	00.5
	03	330 57.4	270 53.1	·· 44.9	279 50.5	·· 52.2	250 20.2	·· 42.9	192 17.2	·· 00.4
	04	345 59.8	285 52.8	45.5	294 51.1	52.6	265 22.0	42.9	207 19.3	00.3
	05	1 02.3	300 52.5	46.1	309 51.8	53.1	280 23.9	43.0	222 21.5	00.3
	06	16 04.8	315 52.3	N17 46.7	324 52.5	N17 53.6	295 25.8	N22 43.0	237 23.7	N17 00.2
	07	31 07.2	330 52.0	47.2	339 53.1	54.0	310 27.6	43.1	252 25.8	00.1
	08	46 09.7	345 51.7	47.8	354 53.8	54.5	325 29.5	43.1	267 28.0	17 00.0
F	09	61 12.1	0 51.4	·· 48.4	9 54.5	·· 55.0	340 31.4	·· 43.1	282 30.2	16 59.9
R	10	76 14.6	15 51.2	49.0	24 55.1	55.4	355 33.2	43.2	297 32.4	59.8
I	11	91 17.1	30 50.9	49.6	39 55.8	55.9	10 35.1	43.2	312 34.5	59.7
D	12	106 19.5	45 50.6	N17 50.1	54 56.5	N17 56.4	25 37.0	N22 43.2	327 36.7	N16 59.7
A	13	121 22.0	60 50.3	50.7	69 57.1	56.8	40 38.8	43.3	342 38.9	59.6
Y	14	136 24.5	75 50.0	51.3	84 57.8	57.3	55 40.7	43.3	357 41.1	59.5
	15	151 26.9	90 49.8	·· 51.9	99 58.5	·· 57.8	70 42.6	·· 43.4	12 43.2	·· 59.4
	16	166 29.4	105 49.5	52.4	114 59.1	58.2	85 44.4	43.4	27 45.4	59.3
	17	181 31.9	120 49.2	53.0	129 59.8	58.7	100 46.3	43.4	42 47.6	59.2
	18	196 34.3	135 48.9	N17 53.6	145 00.4	N17 59.2	115 48.2	N22 43.5	57 49.7	N16 59.1
	19	211 36.8	150 48.6	54.2	160 01.1	17 59.6	130 50.1	43.5	72 51.9	59.1
	20	226 39.3	165 48.4	54.7	175 01.8	18 00.1	145 51.9	43.6	87 54.1	59.0
	21	241 41.7	180 48.1	·· 55.3	190 02.4	·· 00.6	160 53.8	·· 43.6	102 56.3	·· 58.9
	22	256 44.2	195 47.8	55.9	205 03.1	01.0	175 55.7	43.6	117 58.4	58.8
	23	271 46.6	210 47.5	56.5	220 03.8	01.5	190 57.5	43.7	133 00.6	58.7
	Mer. Pass.	h m 4 59.8	v −0.3	d 0.6	v 0.7	d 0.5	v 1.9	d 0.0	v 2.2	d 0.1

STARS

Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 39.1	S40 23.5
Achernar	335 47.1	S57 20.8
Acrux	173 39.6	S62 58.8
Adhara	255 34.2	S28 56.6
Aldebaran	291 20.7	N16 27.8
Alioth	166 44.5	N56 05.2
Alkaid	153 20.1	N49 25.8
Al Na'ir	28 17.4	S47 03.9
Alnilam	276 14.2	S 1 13.0
Alphard	218 22.9	S 8 33.8
Alphecca	126 33.7	N26 47.6
Alpheratz	358 11.4	N28 57.9
Altair	62 34.3	N 8 48.7
Ankaa	353 42.4	S42 25.4
Antares	112 59.2	S26 22.9
Arcturus	146 20.3	N19 18.1
Atria	108 24.8	S68 59.3
Avior	234 29.6	S59 26.4
Bellatrix	279 01.4	N 6 19.7
Betelgeuse	271 30.9	N 7 24.1
Canopus	264 08.7	S52 41.1
Capella	281 14.9	N45 58.4
Deneb	49 49.4	N45 12.0
Denebola	183 01.3	N14 41.9
Diphda	349 23.0	S18 06.4
Dubhe	194 25.2	N61 52.6
Elnath	278 47.2	N28 35.2
Eltanin	90 58.2	N51 29.7
Enif	34 13.4	N 9 46.4
Fomalhaut	15 53.6	S29 44.2
Gacrux	172 31.1	S56 59.5
Gienah	176 20.2	S17 25.1
Hadar	149 26.1	S60 16.1
Hamal	328 31.4	N23 21.3
Kaus Aust.	84 19.3	S34 23.6
Kochab	137 18.5	N74 15.2
Markab	14 05.1	N15 05.1
Menkar	314 43.5	N 4 00.1
Menkent	148 39.4	S36 15.7
Miaplacidus	221 46.1	S69 37.8
Mirfak	309 19.4	N49 46.7
Nunki	76 31.5	S26 19.4
Peacock	54 01.2	S56 48.2
Pollux	244 01.2	N28 04.8
Procyon	245 28.4	N 5 16.9
Rasalhague	96 31.3	N12 34.7
Regulus	208 12.5	N12 04.6
Rigel	281 38.4	S 8 13.7
Rigil Kent.	140 28.3	S60 44.7
Sabik	102 43.3	S15 41.8
Schedar	350 11.3	N56 24.6
Shaula	96 58.3	S37 05.2
Sirius	258 57.9	S16 41.2
Spica	158 59.7	S11 02.7
Suhail	223 12.7	S43 20.7
Vega	80 56.8	N38 45.9
Zuben'ubi	137 35.2	S15 56.9

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	301 09.3	8 56
Mars	309 41.6	8 21
Jupiter	279 38.9	10 21
Saturn	221 27.6	14 13

G.M.T.			SUN		MOON				
			G.H.A.	Dec.	G.H.A.	v	Dec.	d	H.P.
d		h	° ′	° ′	° ′	′	° ′	′	′
6		00	178 51.3	N22 43.4	295 48.4	12.4	S 2 12.6	10.5	57.1
		01	193 51.2	43.1	310 19.8	12.4	2 02.1	10.5	57.0
		02	208 51.1	42.9	324 51.2	12.5	1 51.6	10.5	57.0
		03	223 51.0	·· 42.6	339 22.7	12.6	1 41.1	10.5	56.9
		04	238 50.9	42.4	353 54.3	12.6	1 30.6	10.4	56.9
		05	253 50.8	42.1	8 25.9	12.6	1 20.2	10.5	56.9
		06	268 50.7	N22 41.9	22 57.5	12.7	S 1 09.7	10.4	56.8
	W	07	283 50.6	41.6	37 29.2	12.7	0 59.3	10.5	56.8
	E	08	298 50.5	41.4	52 00.9	12.8	0 48.8	10.4	56.8
	D	09	313 50.4	·· 41.1	66 32.7	12.8	0 38.4	10.4	56.7
	N	10	328 50.3	40.9	81 04.5	12.9	0 28.0	10.4	56.7
	E	11	343 50.2	40.6	95 36.4	12.9	0 17.6	10.4	56.6
	S	12	358 50.1	N22 40.4	110 08.3	12.9	S 0 07.2	10.4	56.6
	D	13	13 50.0	40.1	124 40.2	13.0	N 0 03.2	10.4	56.6
	A	14	28 49.9	39.9	139 12.2	13.0	0 13.6	10.3	56.5
	Y	15	43 49.8	·· 39.6	153 44.2	13.0	0 23.9	10.4	56.5
		16	58 49.7	39.4	168 16.2	13.1	0 34.3	10.3	56.5
		17	73 49.6	39.1	182 48.3	13.2	0 44.6	10.3	56.4
		18	88 49.5	N22 38.8	197 20.5	13.1	N 0 54.9	10.3	56.4
		19	103 49.4	38.6	211 52.6	13.2	1 05.2	10.3	56.4
		20	118 49.2	38.3	226 24.8	13.3	1 15.5	10.2	56.3
		21	133 49.1	·· 38.1	240 57.1	13.2	1 25.7	10.2	56.3
		22	148 49.0	37.8	255 29.3	13.3	1 35.9	10.2	56.3
		23	163 48.9	37.5	270 01.6	13.3	1 46.1	10.2	56.2
7		00	178 48.8	N22 37.3	284 33.9	13.4	N 1 56.3	10.2	56.2
		01	193 48.7	37.0	299 06.3	13.4	2 06.5	10.2	56.2
		02	208 48.6	36.8	313 38.7	13.4	2 16.7	10.1	56.1
		03	223 48.5	·· 36.5	328 11.1	13.5	2 26.8	10.1	56.1
		04	238 48.4	36.2	342 43.6	13.4	2 36.9	10.1	56.1
		05	253 48.3	36.0	357 16.0	13.5	2 47.0	10.0	56.0
		06	268 48.2	N22 35.7	11 48.5	13.6	N 2 57.0	10.0	56.0
		07	283 48.1	35.4	26 21.1	13.5	3 07.0	10.0	56.0
	T	08	298 48.0	35.2	40 53.6	13.6	3 17.0	10.0	55.9
	H	09	313 47.9	·· 34.9	55 26.2	13.6	3 27.0	10.0	55.9
	U	10	328 47.8	34.6	69 58.8	13.6	3 37.0	9.9	55.9
	R	11	343 47.7	34.4	84 31.4	13.7	3 46.9	9.9	55.8
	S	12	358 47.6	N22 34.1	99 04.1	13.6	N 3 56.8	9.8	55.8
	D	13	13 47.5	33.8	113 36.7	13.7	4 06.6	9.9	55.8
	A	14	28 47.4	33.5	128 09.4	13.7	4 16.5	9.8	55.8
	Y	15	43 47.3	·· 33.3	142 42.1	13.8	4 26.3	9.7	55.7
		16	58 47.2	33.0	157 14.9	13.7	4 36.0	9.8	55.7
		17	73 47.1	32.7	171 47.6	13.8	4 45.8	9.7	55.7
		18	88 47.0	N22 32.5	186 20.4	13.8	N 4 55.5	9.7	55.6
		19	103 46.9	32.2	200 53.2	13.8	5 05.2	9.6	55.6
		20	118 46.8	31.9	215 26.0	13.8	5 14.8	9.6	55.6
		21	133 46.7	·· 31.6	229 58.8	13.8	5 24.4	9.6	55.5
		22	148 46.6	31.4	244 31.6	13.8	5 34.0	9.5	55.5
		23	163 46.5	31.1	259 04.4	13.9	5 43.5	9.6	55.5
8		00	178 46.4	N22 30.8	273 37.3	13.9	N 5 53.1	9.4	55.5
		01	193 46.3	30.5	288 10.2	13.8	6 02.5	9.5	55.4
		02	208 46.2	30.2	302 43.0	13.9	6 12.0	9.4	55.4
		03	223 46.1	·· 30.0	317 15.9	13.9	6 21.4	9.3	55.4
		04	238 46.1	29.7	331 48.8	14.0	6 30.7	9.3	55.4
		05	253 46.0	29.4	346 21.8	13.9	6 40.0	9.3	55.3
		06	268 45.9	N22 29.1	0 54.7	13.9	N 6 49.3	9.3	55.3
		07	283 45.8	28.8	15 27.6	14.0	6 58.6	9.2	55.3
		08	298 45.7	28.6	30 00.6	13.9	7 07.8	9.2	55.3
	F	09	313 45.6	·· 28.3	44 33.5	14.0	7 17.0	9.1	55.2
	R	10	328 45.5	28.0	59 06.5	13.9	7 26.1	9.1	55.2
	I	11	343 45.4	27.7	73 39.4	14.0	7 35.2	9.0	55.2
	D	12	358 45.3	N22 27.4	88 12.4	14.0	N 7 44.2	9.0	55.2
	A	13	13 45.2	27.1	102 45.4	13.9	7 53.2	9.0	55.1
	Y	14	28 45.1	26.8	117 18.3	14.0	8 02.2	8.9	55.1
		15	43 45.0	·· 26.5	131 51.3	14.0	8 11.1	8.9	55.1
		16	58 44.9	26.3	146 24.3	14.0	8 20.0	8.8	55.1
		17	73 44.8	26.0	160 57.3	14.0	8 28.8	8.8	55.0
		18	88 44.7	N22 25.7	175 30.3	14.0	N 8 37.6	8.8	55.0
		19	103 44.6	25.4	190 03.3	14.0	8 46.4	8.7	55.0
		20	118 44.5	25.1	204 36.3	13.9	8 55.1	8.6	55.0
		21	133 44.4	·· 24.8	219 09.2	14.0	9 03.7	8.6	54.9
		22	148 44.3	24.5	233 42.2	14.0	9 12.3	8.6	54.9
		23	163 44.2	24.2	248 15.2	14.0	9 20.9	8.5	54.9
			S.D. 15.8	d 0.3	S.D. 15.4		15.2		15.0

Lat.	Twilight		Sunrise	Moonrise			
	Naut.	Civil		6	7	8	9
°	h m	h m	h m	h m	h m	h m	h m
N 72	▭	▭	▭	22 40	22 33	22 27	22 20
N 70	▭	▭	▭	22 42	22 41	22 41	22 41
68	▭	▭	▭	22 44	22 47	22 52	22 58
66	////	////	00 57	22 45	22 53	23 01	23 12
64	////	////	01 53	22 46	22 57	23 09	23 23
62	////	////	02 26	22 47	23 01	23 16	23 33
60	////	01 19	02 49	22 48	23 05	23 22	23 41
N 58	////	01 58	03 08	22 49	23 08	23 27	23 49
56	////	02 24	03 24	22 50	23 10	23 32	23 55
54	01 13	02 45	03 37	22 51	23 13	23 36	24 01
52	01 49	03 02	03 49	22 51	23 15	23 40	24 06
50	02 13	03 16	03 59	22 52	23 17	23 43	24 11
45	02 56	03 44	04 21	22 53	23 22	23 51	24 21
N 40	03 25	04 06	04 38	22 54	23 25	23 57	24 30
35	03 47	04 23	04 52	22 55	23 29	24 02	00 02
30	04 05	04 38	05 05	22 56	23 32	24 07	00 07
20	04 33	05 02	05 26	22 58	23 37	24 16	00 16
N 10	04 54	05 21	05 44	22 59	23 41	24 23	00 23
0	05 13	05 39	06 01	23 00	23 46	24 30	00 30
S 10	05 29	05 55	06 18	23 02	23 50	24 37	00 37
20	05 45	06 12	06 36	23 03	23 54	24 45	00 45
30	06 00	06 30	06 56	23 05	24 00	00 00	00 53
35	06 09	06 40	07 08	23 06	24 03	00 03	00 58
40	06 17	06 51	07 22	23 07	24 06	00 06	01 04
45	06 27	07 04	07 38	23 08	24 10	00 10	01 11
S 50	06 38	07 19	07 57	23 09	24 15	00 15	01 19
52	06 43	07 26	08 07	23 10	24 17	00 17	01 22
54	06 48	07 34	08 17	23 11	24 20	00 20	01 26
56	06 54	07 43	08 29	23 12	24 22	00 22	01 31
58	07 01	07 52	08 43	23 13	24 26	00 26	01 36
S 60	07 08	08 03	08 59	23 14	24 29	00 29	01 42

Lat.	Sunset	Twilight		Moonset			
		Civil	Naut.	6	7	8	9
°	h m	h m	h m	h m	h m	h m	h m
N 72	▭	▭	▭	10 30	12 12	13 52	15 32
N 70	▭	▭	▭	10 31	12 07	13 40	15 11
68	▭	▭	▭	10 32	12 02	13 30	14 56
66	23 08	////	////	10 32	11 58	13 22	14 43
64	22 14	////	////	10 33	11 55	13 15	14 32
62	21 43	////	////	10 33	11 52	13 09	14 23
60	21 19	22 48	////	10 33	11 50	13 04	14 16
N 58	21 01	22 10	////	10 33	11 48	12 59	14 09
56	20 45	21 44	////	10 34	11 46	12 55	14 03
54	20 32	21 24	22 55	10 34	11 44	12 52	13 58
52	20 20	21 07	22 20	10 34	11 42	12 49	13 53
50	20 10	20 53	21 55	10 34	11 41	12 46	13 49
45	19 49	20 25	21 13	10 35	11 38	12 39	13 39
N 40	19 31	20 04	20 45	10 35	11 35	12 34	13 31
35	19 17	19 46	20 23	10 35	11 33	12 30	13 25
30	19 05	19 32	20 05	10 35	11 31	12 26	13 19
20	18 44	19 08	19 37	10 36	11 28	12 19	13 09
N 10	18 25	18 48	19 15	10 36	11 25	12 13	13 00
0	18 08	18 31	18 57	10 36	11 22	12 07	12 52
S 10	17 52	18 14	18 41	10 37	11 19	12 01	12 43
20	17 34	17 58	18 25	10 37	11 16	11 55	12 35
30	17 14	17 40	18 10	10 37	11 13	11 48	12 24
35	17 02	17 30	18 01	10 37	11 11	11 44	12 19
40	16 48	17 19	17 52	10 37	11 09	11 40	12 12
45	16 32	17 06	17 43	10 38	11 06	11 35	12 05
S 50	16 13	16 51	17 32	10 38	11 03	11 29	11 55
52	16 03	16 43	17 27	10 38	11 02	11 26	11 51
54	15 53	16 36	17 21	10 38	11 00	11 23	11 47
56	15 41	16 27	17 16	10 38	10 59	11 19	11 42
58	15 27	16 18	17 09	10 38	10 57	11 16	11 36
S 60	15 11	16 07	17 02	10 38	10 55	11 11	11 29

Day	SUN			MOON			
	Eqn. of Time		Mer. Pass.	Mer. Pass.		Age	Phase
	00ʰ	12ʰ		Upper	Lower		
	m s	m s	h m	h m	h m	d	
6	04 34	04 40	12 05	04 25	16 48	20	
7	04 44	04 49	12 05	05 11	17 34	21	◑
8	04 54	04 59	12 05	05 56	18 19	22	

1977 JULY 9, 10, 11 (SAT., SUN., MON.)

G.M.T.		ARIES	VENUS −3.7		MARS +1.2		JUPITER −1.5		SATURN +0.7	
		G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
d h		° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
9 00		286 49.1	225 47.2	N17 57.0	235 04.4	N18 02.0	205 59.4	N22 43.7	148 02.8	N16 58.6
01		301 51.6	240 46.9	57.6	250 05.1	02.4	221 01.3	43.7	163 04.9	58.5
02		316 54.0	255 46.6	58.2	265 05.8	02.9	236 03.1	43.8	178 07.1	58.4
03		331 56.5	270 46.4	·· 58.8	280 06.4	·· 03.3	251 05.0	·· 43.8	193 09.3	·· 58.4
04		346 59.0	285 46.1	59.3	295 07.1	03.8	266 06.9	43.9	208 11.4	58.3
05		2 01.4	300 45.8	17 59.9	310 07.8	04.3	281 08.7	43.9	223 13.6	58.2
06		17 03.9	315 45.5	N18 00.5	325 08.4	N18 04.7	296 10.6	N22 43.9	238 15.8	N16 58.1
07		32 06.4	330 45.2	01.0	340 09.1	05.2	311 12.5	44.0	253 18.0	58.0
08	S	47 08.8	345 44.9	01.6	355 09.8	05.7	326 14.3	44.0	268 20.1	57.9
09	A	62 11.3	0 44.6	·· 02.2	10 10.4	·· 06.1	341 16.2	·· 44.0	283 22.3	·· 57.8
10	T	77 13.8	15 44.3	02.7	25 11.1	06.6	356 18.1	44.1	298 24.5	57.8
11	U	92 16.2	30 44.0	03.3	40 11.8	07.0	11 20.0	44.1	313 26.6	57.7
12	R	107 18.7	45 43.7	N18 03.9	55 12.4	N18 07.5	26 21.8	N22 44.2	328 28.8	N16 57.6
13	D	122 21.1	60 43.5	04.4	70 13.1	08.0	41 23.7	44.2	343 31.0	57.5
14	A	137 23.6	75 43.2	05.0	85 13.7	08.4	56 25.6	44.2	358 33.2	57.4
15	Y	152 26.1	90 42.9	·· 05.6	100 14.4	·· 08.9	71 27.4	·· 44.3	13 35.3	·· 57.3
16		167 28.5	105 42.6	06.1	115 15.1	09.3	86 29.3	44.3	28 37.5	57.2
17		182 31.0	120 42.3	06.7	130 15.7	09.8	101 31.2	44.3	43 39.7	57.1
18		197 33.5	135 42.0	N18 07.3	145 16.4	N18 10.3	116 33.0	N22 44.4	58 41.8	N16 57.1
19		212 35.9	150 41.7	07.8	160 17.1	10.7	131 34.9	44.4	73 44.0	57.0
20		227 38.4	165 41.4	08.4	175 17.7	11.2	146 36.8	44.5	88 46.2	56.9
21		242 40.9	180 41.1	·· 08.9	190 18.4	·· 11.6	161 38.7	·· 44.5	103 48.3	·· 56.8
22		257 43.3	195 40.8	09.5	205 19.1	12.1	176 40.5	44.5	118 50.5	56.7
23		272 45.8	210 40.5	10.1	220 19.7	12.5	191 42.4	44.6	133 52.7	56.6
10 00		287 48.2	225 40.2	N18 10.6	235 20.4	N18 13.0	206 44.3	N22 44.6	148 54.9	N16 56.5
01		302 50.7	240 39.9	11.2	250 21.1	13.4	221 46.1	44.6	163 57.0	56.5
02		317 53.2	255 39.6	11.7	265 21.7	13.9	236 48.0	44.7	178 59.2	56.4
03		332 55.6	270 39.3	·· 12.3	280 22.4	·· 14.4	251 49.9	·· 44.7	194 01.4	·· 56.3
04		347 58.1	285 39.0	12.9	295 23.0	14.8	266 51.7	44.7	209 03.5	56.2
05		3 00.6	300 38.7	13.4	310 23.7	15.3	281 53.6	44.8	224 05.7	56.1
06		18 03.0	315 38.4	N18 14.0	325 24.4	N18 15.7	296 55.5	N22 44.8	239 07.9	N16 56.0
07		33 05.5	330 38.0	14.5	340 25.0	16.2	311 57.4	44.9	254 10.0	55.9
08		48 08.0	345 37.7	15.1	355 25.7	16.6	326 59.2	44.9	269 12.2	55.8
09	S	63 10.4	0 37.4	·· 15.7	10 26.4	·· 17.1	342 01.1	·· 44.9	284 14.4	·· 55.8
10	U	78 12.9	15 37.1	16.2	25 27.0	17.5	357 03.0	45.0	299 16.6	55.7
11	N	93 15.4	30 36.8	16.8	40 27.7	18.0	12 04.8	45.0	314 18.7	55.6
12	D	108 17.8	45 36.5	N18 17.3	55 28.4	N18 18.4	27 06.7	N22 45.0	329 20.9	N16 55.5
13	A	123 20.3	60 36.2	17.9	70 29.0	18.9	42 08.6	45.1	344 23.1	55.4
14	Y	138 22.7	75 35.9	18.4	85 29.7	19.3	57 10.5	45.1	359 25.2	55.3
15		153 25.2	90 35.6	·· 19.0	100 30.4	·· 19.8	72 12.3	·· 45.1	14 27.4	·· 55.2
16		168 27.7	105 35.3	19.5	115 31.0	20.3	87 14.2	45.2	29 29.6	55.1
17		183 30.1	120 35.0	20.1	130 31.7	20.7	102 16.1	45.2	44 31.7	55.1
18		198 32.6	135 34.6	N18 20.6	145 32.3	N18 21.2	117 17.9	N22 45.2	59 33.9	N16 55.0
19		213 35.1	150 34.3	21.2	160 33.0	21.6	132 19.8	45.3	74 36.1	54.9
20		228 37.5	165 34.0	21.7	175 33.7	22.1	147 21.7	45.3	89 38.2	54.8
21		243 40.0	180 33.7	·· 22.3	190 34.3	·· 22.5	162 23.6	·· 45.4	104 40.4	·· 54.7
22		258 42.5	195 33.4	22.8	205 35.0	23.0	177 25.4	45.4	119 42.6	54.6
23		273 44.9	210 33.1	23.4	220 35.7	23.4	192 27.3	45.4	134 44.7	54.5
11 00		288 47.4	225 32.7	N18 23.9	235 36.3	N18 23.9	207 29.2	N22 45.5	149 46.9	N16 54.4
01		303 49.9	240 32.4	24.5	250 37.0	24.3	222 31.0	45.5	164 49.1	54.4
02		318 52.3	255 32.1	25.0	265 37.7	24.7	237 32.9	45.5	179 51.3	54.3
03		333 54.8	270 31.8	·· 25.6	280 38.3	·· 25.2	252 34.8	·· 45.6	194 53.4	·· 54.2
04		348 57.2	285 31.5	26.1	295 39.0	25.6	267 36.7	45.6	209 55.6	54.1
05		3 59.7	300 31.2	26.6	310 39.6	26.1	282 38.5	45.6	224 57.8	54.0
06		19 02.2	315 30.8	N18 27.2	325 40.3	N18 26.5	297 40.4	N22 45.7	239 59.9	N16 53.9
07		34 04.6	330 30.5	27.7	340 41.0	27.0	312 42.3	45.7	255 02.1	53.8
08		49 07.1	345 30.2	28.3	355 41.6	27.4	327 44.2	45.7	270 04.3	53.7
09	M	64 09.6	0 29.9	·· 28.8	10 42.3	·· 27.9	342 46.0	·· 45.8	285 06.4	·· 53.7
10	O	79 12.0	15 29.5	29.4	25 43.0	28.3	357 47.9	45.8	300 08.6	53.6
11	N	94 14.5	30 29.2	29.9	40 43.6	28.8	12 49.8	45.9	315 10.8	53.5
12	D	109 17.0	45 28.9	N18 30.4	55 44.3	N18 29.2	27 51.6	N22 45.9	330 12.9	N16 53.4
13	A	124 19.4	60 28.6	31.0	70 45.0	29.7	42 53.5	45.9	345 15.1	53.3
14	Y	139 21.9	75 28.2	31.5	85 45.6	30.1	57 55.4	46.0	0 17.3	53.2
15		154 24.3	90 27.9	·· 32.1	100 46.3	·· 30.5	72 57.3	·· 46.0	15 19.4	·· 53.1
16		169 26.8	105 27.6	32.6	115 46.9	31.0	87 59.1	46.0	30 21.6	53.0
17		184 29.3	120 27.3	33.1	130 47.6	31.4	103 01.0	46.1	45 23.8	53.0
18		199 31.7	135 26.9	N18 33.7	145 48.3	N18 31.9	118 02.9	N22 46.1	60 25.9	N16 52.9
19		214 34.2	150 26.6	34.2	160 48.9	32.3	133 04.8	46.1	75 28.1	52.8
20		229 36.7	165 26.3	34.8	175 49.6	32.8	148 06.6	46.2	90 30.3	52.7
21		244 39.1	180 25.9	·· 35.3	190 50.3	·· 33.2	163 08.5	·· 46.2	105 32.4	·· 52.6
22		259 41.6	195 25.6	35.8	205 50.9	33.6	178 10.4	46.2	120 34.6	52.5
23		274 44.1	210 25.3	36.4	220 51.6	34.1	193 12.3	46.3	135 36.8	52.4
Mer. Pass.		h m 4 48.0	v −0.3	d 0.6	v 0.7	d 0.5	v 1.9	d 0.0	v 2.2	d 0.1

STARS		
Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 39.1	S40 23.5
Achernar	335 47.0	S57 20.8
Acrux	173 39.6	S62 58.8
Adhara	255 34.2	S28 56.6
Aldebaran	291 20.7	N16 27.8
Alioth	166 44.5	N56 05.2
Alkaid	153 20.2	N49 25.8
Al Na'ir	28 17.3	S47 03.9
Alnilam	276 14.1	S 1 13.0
Alphard	218 22.9	S 8 33.8
Alphecca	126 33.7	N26 47.6
Alpheratz	358 11.4	N28 57.9
Altair	62 34.3	N 8 48.7
Ankaa	353 42.3	S42 25.4
Antares	112 59.2	S26 22.9
Arcturus	146 20.3	N19 18.1
Atria	108 24.8	S68 59.3
Avior	234 29.6	S59 26.4
Bellatrix	279 01.3	N 6 19.7
Betelgeuse	271 30.9	N 7 24.1
Canopus	264 08.7	S52 41.1
Capella	281 14.9	N45 58.4
Deneb	49 49.4	N45 12.0
Denebola	183 01.4	N14 41.9
Diphda	349 23.0	S18 06.4
Dubhe	194 25.2	N61 52.5
Elnath	278 47.2	N28 35.2
Eltanin	90 58.2	N51 29.7
Enif	34 13.4	N 9 46.4
Fomalhaut	15 53.6	S29 44.2
Gacrux	172 31.1	S56 59.5
Gienah	176 20.2	S17 25.1
Hadar	149 26.1	S60 16.1
Hamal	328 31.4	N23 21.3
Kaus Aust.	84 19.3	S34 23.6
Kochab	137 18.5	N74 15.2
Markab	14 05.1	N15 05.1
Menkar	314 43.5	N 4 00.1
Menkent	148 39.4	S36 15.7
Miaplacidus	221 46.1	S69 37.8
Mirfak	309 19.4	N49 46.7
Nunki	76 31.5	S26 19.4
Peacock	54 01.2	S56 48.2
Pollux	244 01.2	N28 04.8
Procyon	245 28.4	N 5 16.9
Rasalhague	96 31.3	N12 34.7
Regulus	208 12.5	N12 04.6
Rigel	281 38.4	S 8 13.7
Rigil Kent.	140 28.3	S60 44.7
Sabik	102 43.3	S15 41.8
Schedar	350 11.3	N56 24.6
Shaula	96 58.3	S37 05.2
Sirius	258 57.9	S16 41.2
Spica	158 59.8	S11 02.7
Suhail	223 12.7	S43 20.7
Vega	80 56.8	N38 45.9
Zuben'ubi	137 35.2	S15 56.9

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	297 51.9	8 58
Mars	307 32.1	8 18
Jupiter	278 56.0	10 12
Saturn	221 06.6	14 02

G.M.T.	SUN G.H.A.	SUN Dec.	MOON G.H.A.	v	MOON Dec.	d	H.P.
d h	° ′	° ′	° ′	′	° ′	′	′
9 00	178 44.1	N22 23.9	262 48.2	14.0	N 9 29.4	8.5	54.9
01	193 44.0	23.6	277 21.2	14.0	9 37.9	8.4	54.9
02	208 43.9	23.3	291 54.2	13.9	9 46.3	8.4	54.8
03	223 43.8	· · 23.0	306 27.1	14.0	9 54.7	8.3	54.8
04	238 43.8	22.7	321 00.1	14.0	10 03.0	8.3	54.8
05	253 43.7	22.4	335 33.1	13.9	10 11.3	8.2	54.8
06	268 43.6	N22 22.1	350 06.0	14.0	N10 19.5	8.2	54.8
07	283 43.5	21.8	4 39.0	13.9	10 27.7	8.1	54.7
S 08	298 43.4	21.5	19 11.9	14.0	10 35.8	8.1	54.7
A 09	313 43.3	· · 21.2	33 44.9	13.9	10 43.9	8.0	54.7
T 10	328 43.2	20.9	48 17.8	14.0	10 51.9	7.9	54.7
U 11	343 43.1	20.6	62 50.8	13.9	10 59.8	8.0	54.7
R 12	358 43.0	N22 20.3	77 23.7	13.9	N11 07.8	7.8	54.6
D 13	13 42.9	20.0	91 56.6	13.9	11 15.6	7.8	54.6
A 14	28 42.8	19.7	106 29.5	13.9	11 23.4	7.8	54.6
Y 15	43 42.7	· · 19.4	121 02.4	13.9	11 31.2	7.7	54.6
16	58 42.6	19.1	135 35.3	13.9	11 38.9	7.6	54.6
17	73 42.6	18.8	150 08.2	13.8	11 46.5	7.6	54.6
18	88 42.5	N22 18.5	164 41.0	13.9	N11 54.1	7.6	54.5
19	103 42.4	18.2	179 13.9	13.8	12 01.7	7.5	54.5
20	118 42.3	17.9	193 46.7	13.8	12 09.2	7.4	54.5
21	133 42.2	· · 17.6	208 19.5	13.9	12 16.6	7.3	54.5
22	148 42.1	17.3	222 52.4	13.8	12 23.9	7.4	54.5
23	163 42.0	17.0	237 25.2	13.7	12 31.3	7.2	54.5
10 00	178 41.9	N22 16.7	251 57.9	13.8	N12 38.5	7.2	54.5
01	193 41.8	16.4	266 30.7	13.8	12 45.7	7.1	54.4
02	208 41.7	16.0	281 03.5	13.7	12 52.8	7.1	54.4
03	223 41.6	· · 15.7	295 36.2	13.8	12 59.9	7.0	54.4
04	238 41.6	15.4	310 09.0	13.7	13 06.9	7.0	54.4
05	253 41.5	15.1	324 41.7	13.7	13 13.9	6.9	54.4
06	268 41.4	N22 14.8	339 14.4	13.7	N13 20.8	6.8	54.4
07	283 41.3	14.5	353 47.1	13.6	13 27.6	6.8	54.4
08	298 41.2	14.2	8 19.7	13.7	13 34.4	6.7	54.3
S 09	313 41.1	· · 13.8	22 52.4	13.6	13 41.1	6.7	54.3
U 10	328 41.0	13.5	37 25.0	13.6	13 47.8	6.6	54.3
N 11	343 40.9	13.2	51 57.6	13.6	13 54.4	6.5	54.3
D 12	358 40.8	N22 12.9	66 30.2	13.6	N14 00.9	6.5	54.3
A 13	13 40.8	12.6	81 02.8	13.6	14 07.4	6.4	54.3
Y 14	28 40.7	12.2	95 35.4	13.5	14 13.8	6.3	54.3
15	43 40.6	· · 11.9	110 07.9	13.5	14 20.1	6.3	54.3
16	58 40.5	11.6	124 40.4	13.6	14 26.4	6.2	54.3
17	73 40.4	11.3	139 13.0	13.4	14 32.6	6.2	54.2
18	88 40.3	N22 11.0	153 45.4	13.5	N14 38.8	6.0	54.2
19	103 40.2	10.6	168 17.9	13.5	14 44.8	6.0	54.2
20	118 40.1	10.3	182 50.4	13.4	14 50.8	6.0	54.2
21	133 40.1	· · 10.0	197 22.8	13.4	14 56.8	5.9	54.2
22	148 40.0	09.7	211 55.2	13.4	15 02.7	5.8	54.2
23	163 39.9	09.3	226 27.6	13.4	15 08.5	5.7	54.2
11 00	178 39.8	N22 09.0	241 00.0	13.3	N15 14.2	5.7	54.2
01	193 39.7	08.7	255 32.3	13.3	15 19.9	5.6	54.2
02	208 39.6	08.4	270 04.6	13.3	15 25.5	5.6	54.2
03	223 39.5	· · 08.0	284 36.9	13.3	15 31.1	5.4	54.2
04	238 39.5	07.7	299 09.2	13.3	15 36.5	5.4	54.2
05	253 39.4	07.4	313 41.5	13.2	15 41.9	5.4	54.1
06	268 39.3	N22 07.0	328 13.7	13.2	N15 47.3	5.2	54.1
07	283 39.2	06.7	342 45.9	13.2	15 52.5	5.2	54.1
08	298 39.1	06.4	357 18.1	13.2	15 57.7	5.2	54.1
M 09	313 39.0	· · 06.1	11 50.3	13.2	16 02.9	5.0	54.1
O 10	328 38.9	05.7	26 22.5	13.1	16 07.9	5.0	54.1
N 11	343 38.9	05.4	40 54.6	13.1	16 12.9	4.9	54.1
D 12	358 38.8	N22 05.0	55 26.7	13.1	N16 17.8	4.8	54.1
A 13	13 38.7	04.7	69 58.8	13.1	16 22.6	4.8	54.1
Y 14	28 38.6	04.4	84 30.9	13.0	16 27.4	4.7	54.1
15	43 38.5	· · 04.0	99 02.9	13.0	16 32.1	4.6	54.1
16	58 38.4	03.7	113 34.9	13.0	16 36.7	4.5	54.1
17	73 38.4	03.4	128 06.9	13.0	16 41.2	4.5	54.1
18	88 38.3	N22 03.0	142 38.9	13.0	N16 45.7	4.4	54.1
19	103 38.2	02.7	157 10.9	12.9	16 50.1	4.3	54.1
20	118 38.1	02.4	171 42.8	12.9	16 54.4	4.3	54.1
21	133 38.0	· · 02.0	186 14.7	12.9	16 58.7	4.1	54.1
22	148 37.9	01.7	200 46.6	12.9	17 02.8	4.1	54.1
23	163 37.9	01.3	215 18.5	12.8	17 06.9	4.0	54.1
	S.D. 15.8	d 0.3	S.D. 14.9		14.8		14.7

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 9	Moonrise 10	Moonrise 11	Moonrise 12
°	h m	h m	h m	h m	h m	h m	h m
N 72	□	□	□	22 20	22 11	21 58	□
N 70	□	□	□	22 41	22 44	22 50	23 04
68	□	□	□	22 58	23 07	23 22	23 46
66	////	////	01 11	23 12	23 26	23 46	24 15
64	////	////	02 01	23 23	23 41	24 04	00 04
62	////	////	02 31	23 33	23 54	24 20	00 20
60	////	01 28	02 54	23 41	24 04	00 04	00 33
N 58	////	02 04	03 12	23 49	24 14	00 14	00 44
56	////	02 29	03 28	23 55	24 22	00 22	00 54
54	01 21	02 49	03 41	24 01	00 01	00 29	01 02
52	01 54	03 05	03 52	24 06	00 06	00 36	01 10
50	02 18	03 19	04 02	24 11	00 11	00 42	01 17
45	02 59	03 47	04 23	24 21	00 21	00 55	01 32
N 40	03 27	04 08	04 40	24 30	00 30	01 05	01 44
35	03 49	04 25	04 54	00 02	00 37	01 14	01 54
30	04 06	04 39	05 06	00 07	00 44	01 22	02 03
20	04 34	05 03	05 27	00 16	00 55	01 36	02 19
N 10	04 55	05 22	05 45	00 23	01 05	01 49	02 33
0	05 13	05 39	06 02	00 30	01 15	02 00	02 46
S 10	05 29	05 55	06 18	00 37	01 24	02 12	02 59
20	05 45	06 12	06 36	00 45	01 34	02 24	03 13
30	06 00	06 30	06 56	00 53	01 46	02 38	03 29
35	06 08	06 39	07 07	00 58	01 53	02 46	03 39
40	06 17	06 50	07 21	01 04	02 01	02 56	03 49
45	06 26	07 03	07 36	01 11	02 10	03 07	04 02
S 50	06 37	07 18	07 56	01 19	02 20	03 20	04 17
52	06 42	07 25	08 05	01 22	02 26	03 27	04 25
54	06 47	07 32	08 15	01 26	02 31	03 33	04 33
56	06 52	07 41	08 26	01 31	02 37	03 41	04 42
58	06 59	07 50	08 40	01 36	02 44	03 50	04 52
S 60	07 05	08 01	08 56	01 42	02 52	04 00	05 03

Lat.	Sunset	Twilight Civil	Twilight Naut.	Moonset 9	Moonset 10	Moonset 11	Moonset 12
°	h m	h m	h m	h m	h m	h m	h m
N 72	□	□	□	15 32	17 14	19 03	□
N 70	□	□	□	15 11	16 42	18 12	19 34
68	□	□	□	14 56	16 19	17 40	18 52
66	22 55	////	////	14 43	16 02	17 16	18 24
64	22 08	////	////	14 32	15 47	16 58	18 03
62	21 38	////	////	14 23	15 35	16 43	17 45
60	21 15	22 40	////	14 16	15 25	16 31	17 31
N 58	20 57	22 05	////	14 09	15 16	16 20	17 19
56	20 42	21 40	////	14 03	15 08	16 10	17 08
54	20 29	21 21	22 47	13 58	15 01	16 02	16 59
52	20 18	21 05	22 15	13 53	14 55	15 55	16 51
50	20 08	20 51	21 52	13 49	14 49	15 48	16 43
45	19 47	20 24	21 11	13 39	14 37	15 34	16 27
N 40	19 30	20 02	20 43	13 31	14 27	15 22	16 14
35	19 16	19 45	20 21	13 25	14 19	15 12	16 03
30	19 04	19 31	20 04	13 19	14 11	15 03	15 54
20	18 43	19 08	19 36	13 09	13 58	14 48	15 37
N 10	18 25	18 48	19 15	13 00	13 47	14 35	15 22
0	18 09	18 31	18 57	12 52	13 37	14 22	15 09
S 10	17 52	18 15	18 41	12 43	13 26	14 10	14 55
20	17 35	17 59	18 26	12 35	13 15	13 57	14 41
30	17 15	17 41	18 11	12 24	13 02	13 42	14 24
35	17 04	17 31	18 03	12 19	12 55	13 33	14 14
40	16 50	17 20	17 54	12 12	12 46	13 23	14 03
45	16 35	17 08	17 45	12 05	12 36	13 11	13 51
S 50	16 15	16 53	17 34	11 55	12 25	12 57	13 35
52	16 06	16 46	17 29	11 51	12 19	12 51	13 27
54	15 56	16 39	17 24	11 47	12 13	12 44	13 19
56	15 44	16 30	17 18	11 42	12 06	12 35	13 10
58	15 31	16 21	17 12	11 36	11 59	12 26	13 00
S 60	15 15	16 10	17 06	11 29	11 51	12 16	12 48

Day	SUN Eqn. of Time 00ʰ	SUN Eqn. of Time 12ʰ	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	Age	Phase
	m s	m s	h m	h m	h m	d	
9	05 03	05 08	12 05	06 41	19 03	23	🌘
10	05 12	05 16	12 05	07 26	19 48	24	
11	05 21	05 25	12 05	08 11	20 34	25	

G.M.T.		ARIES	VENUS −3.7		MARS +1.2		JUPITER −1.5		SATURN +0.7	
		G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
d	h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
12	00	289 46.5	225 24.9	N18 36.9	235 52.3	N18 34.5	208 14.1	N22 46.3	150 38.9	N16 52.3
	01	304 49.0	240 24.6	37.4	250 52.9	35.0	223 16.0	46.3	165 41.1	52.2
	02	319 51.5	255 24.3	38.0	265 53.6	35.4	238 17.9	46.4	180 43.3	52.2
	03	334 53.9	270 23.9	· · 38.5	280 54.2	· · 35.9	253 19.8	· · 46.4	195 45.4	· · 52.1
	04	349 56.4	285 23.6	39.0	295 54.9	36.3	268 21.6	46.4	210 47.6	52.0
	05	4 58.8	300 23.3	39.6	310 55.6	36.7	283 23.5	46.5	225 49.8	51.9
	06	20 01.3	315 22.9	N18 40.1	325 56.2	N18 37.2	298 25.4	N22 46.5	240 51.9	N16 51.8
	07	35 03.8	330 22.6	40.6	340 56.9	37.6	313 27.3	46.5	255 54.1	51.7
	08	50 06.2	345 22.3	41.1	355 57.6	38.0	328 29.1	46.6	270 56.3	51.6
T	09	65 08.7	0 21.9	· · 41.7	10 58.2	· · 38.5	343 31.0	· · 46.6	285 58.4	· · 51.5
U	10	80 11.2	15 21.6	42.2	25 58.9	38.9	358 32.9	46.6	301 00.6	51.5
E	11	95 13.6	30 21.3	42.7	40 59.5	39.4	13 34.8	46.7	316 02.8	51.4
S	12	110 16.1	45 20.9	N18 43.3	56 00.2	N18 39.8	28 36.6	N22 46.7	331 04.9	N16 51.3
D	13	125 18.6	60 20.6	43.8	71 00.9	40.2	43 38.5	46.7	346 07.1	51.2
A	14	140 21.0	75 20.2	44.3	86 01.5	40.7	58 40.4	46.8	1 09.3	51.1
Y	15	155 23.5	90 19.9	· · 44.8	101 02.2	· · 41.1	73 42.3	· · 46.8	16 11.4	· · 51.0
	16	170 26.0	105 19.5	45.4	116 02.9	41.5	88 44.1	46.8	31 13.6	50.9
	17	185 28.4	120 19.2	45.9	131 03.5	42.0	103 46.0	46.9	46 15.8	50.8
	18	200 30.9	135 18.9	N18 46.4	146 04.2	N18 42.4	118 47.9	N22 46.9	61 17.9	N16 50.7
	19	215 33.3	150 18.5	46.9	161 04.9	42.9	133 49.8	47.0	76 20.1	50.7
	20	230 35.8	165 18.2	47.5	176 05.5	43.3	148 51.6	47.0	91 22.3	50.6
	21	245 38.3	180 17.8	· · 48.0	191 06.2	· · 43.7	163 53.5	· · 47.0	106 24.4	· · 50.5
	22	260 40.7	195 17.5	48.5	206 06.8	44.2	178 55.4	47.1	121 26.6	50.4
	23	275 43.2	210 17.1	49.0	221 07.5	44.6	193 57.3	47.1	136 28.8	50.3
13	00	290 45.7	225 16.8	N18 49.5	236 08.2	N18 45.0	208 59.1	N22 47.1	151 30.9	N16 50.2
	01	305 48.1	240 16.4	50.1	251 08.8	45.5	224 01.0	47.2	166 33.1	50.1
	02	320 50.6	255 16.1	50.6	266 09.5	45.9	239 02.9	47.2	181 35.3	50.0
	03	335 53.1	270 15.7	· · 51.1	281 10.2	· · 46.3	254 04.8	· · 47.2	196 37.4	· · 49.9
	04	350 55.5	285 15.4	51.6	296 10.8	46.8	269 06.6	47.3	211 39.6	49.9
	05	5 58.0	300 15.0	52.1	311 11.5	47.2	284 08.5	47.3	226 41.8	49.8
	06	21 00.4	315 14.7	N18 52.7	326 12.1	N18 47.6	299 10.4	N22 47.3	241 43.9	N16 49.7
W	07	36 02.9	330 14.3	53.2	341 12.8	48.1	314 12.3	47.4	256 46.1	49.6
E	08	51 05.4	345 14.0	53.7	356 13.5	48.5	329 14.1	47.4	271 48.3	49.5
D	09	66 07.8	0 13.6	· · 54.2	11 14.1	· · 48.9	344 16.0	· · 47.4	286 50.4	· · 49.4
N	10	81 10.3	15 13.3	54.7	26 14.8	49.3	359 17.9	47.5	301 52.6	49.3
E	11	96 12.8	30 12.9	55.2	41 15.5	49.8	14 19.8	47.5	316 54.8	49.2
S	12	111 15.2	45 12.6	N18 55.7	56 16.1	N18 50.2	29 21.7	N22 47.5	331 56.9	N16 49.1
D	13	126 17.7	60 12.2	56.3	71 16.8	50.6	44 23.5	47.5	346 59.1	49.1
A	14	141 20.2	75 11.9	56.8	86 17.4	51.1	59 25.4	47.6	2 01.3	49.0
Y	15	156 22.6	90 11.5	· · 57.3	101 18.1	· · 51.5	74 27.3	· · 47.6	17 03.4	· · 48.9
	16	171 25.1	105 11.1	57.8	116 18.8	51.9	89 29.2	47.6	32 05.6	48.8
	17	186 27.6	120 10.8	58.3	131 19.4	52.4	104 31.0	47.7	47 07.8	48.7
	18	201 30.0	135 10.4	N18 58.8	146 20.1	N18 52.8	119 32.9	N22 47.7	62 09.9	N16 48.6
	19	216 32.5	150 10.1	59.3	161 20.8	53.2	134 34.8	47.7	77 12.1	48.5
	20	231 34.9	165 09.7	18 59.8	176 21.4	53.6	149 36.7	47.8	92 14.3	48.4
	21	246 37.4	180 09.3	19 00.3	191 22.1	· · 54.1	164 38.6	· · 47.8	107 16.4	· · 48.3
	22	261 39.9	195 09.0	00.8	206 22.7	54.5	179 40.4	47.8	122 18.6	48.3
	23	276 42.3	210 08.6	01.3	221 23.4	54.9	194 42.3	47.9	137 20.7	48.2
14	00	291 44.8	225 08.3	N19 01.8	236 24.1	N18 55.3	209 44.2	N22 47.9	152 22.9	N16 48.1
	01	306 47.3	240 07.9	02.4	251 24.7	55.8	224 46.1	47.9	167 25.1	48.0
	02	321 49.7	255 07.5	02.9	266 25.4	56.2	239 47.9	48.0	182 27.2	47.9
	03	336 52.2	270 07.2	· · 03.4	281 26.1	· · 56.6	254 49.8	· · 48.0	197 29.4	· · 47.8
	04	351 54.7	285 06.8	03.9	296 26.7	57.0	269 51.7	48.0	212 31.6	47.7
	05	6 57.1	300 06.4	04.4	311 27.4	57.5	284 53.6	48.1	227 33.7	47.6
	06	21 59.6	315 06.1	N19 04.9	326 28.1	N18 57.9	299 55.5	N22 48.1	242 35.9	N16 47.5
	07	37 02.1	330 05.7	05.4	341 28.7	58.3	314 57.3	48.1	257 38.1	47.5
T	08	52 04.5	345 05.3	05.9	356 29.4	58.7	329 59.2	48.2	272 40.2	47.4
H	09	67 07.0	0 05.0	· · 06.4	11 30.0	· · 59.2	345 01.1	· · 48.2	287 42.4	· · 47.3
U	10	82 09.4	15 04.6	06.9	26 30.7	18 59.6	0 03.0	48.2	302 44.6	47.2
R	11	97 11.9	30 04.2	07.4	41 31.4	19 00.0	15 04.9	48.3	317 46.7	47.1
S	12	112 14.4	45 03.9	N19 07.9	56 32.0	N19 00.4	30 06.7	N22 48.3	332 48.9	N16 47.0
D	13	127 16.8	60 03.5	08.4	71 32.7	00.9	45 08.6	48.3	347 51.0	46.9
A	14	142 19.3	75 03.1	08.9	86 33.4	01.3	60 10.5	48.4	2 53.2	46.8
Y	15	157 21.8	90 02.8	· · 09.4	101 34.0	· · 01.7	75 12.4	· · 48.4	17 55.4	· · 46.7
	16	172 24.2	105 02.4	09.9	116 34.7	02.1	90 14.2	48.4	32 57.5	46.6
	17	187 26.7	120 02.0	10.4	131 35.3	02.5	105 16.1	48.5	47 59.7	46.6
	18	202 29.2	135 01.6	N19 10.8	146 36.0	N19 03.0	120 18.0	N22 48.5	63 01.9	N16 46.5
	19	217 31.6	150 01.3	11.3	161 36.7	03.4	135 19.9	48.5	78 04.0	46.4
	20	232 34.1	165 00.9	11.8	176 37.3	03.8	150 21.8	48.5	93 06.2	46.3
	21	247 36.5	180 00.5	· · 12.3	191 38.0	· · 04.2	165 23.6	· · 48.6	108 08.4	· · 46.2
	22	262 39.0	195 00.1	12.8	206 38.7	04.6	180 25.5	48.6	123 10.5	46.1
	23	277 41.5	209 59.8	13.3	221 39.3	05.1	195 27.4	48.6	138 12.7	46.0
Mer. Pass.		h m 4 36.2	v −0.4	d 0.5	v 0.7	d 0.4	v 1.9	d 0.0	v 2.2	d 0.1

STARS		
Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 39.1	S40 23.5
Achernar	335 47.0	S57 20.7
Acrux	173 39.6	S62 58.8
Adhara	255 34.2	S28 56.5
Aldebaran	291 20.7	N16 27.8
Alioth	166 44.5	N56 05.2
Alkaid	153 20.2	N49 25.8
Al Na'ir	28 17.3	S47 03.9
Alnilam	276 14.1	S 1 13.0
Alphard	218 22.9	S 8 33.7
Alphecca	126 33.7	N26 47.6
Alpheratz	358 11.4	N28 57.9
Altair	62 34.3	N 8 48.7
Ankaa	353 42.3	S42 25.4
Antares	112 59.2	S26 22.9
Arcturus	146 20.3	N19 18.1
Atria	108 24.8	S68 59.4
Avior	234 29.6	S59 26.4
Bellatrix	279 01.3	N 6 19.7
Betelgeuse	271 30.9	N 7 24.1
Canopus	264 08.7	S52 41.0
Capella	281 14.8	N45 58.4
Deneb	49 49.4	N45 12.1
Denebola	183 01.4	N14 41.9
Diphda	349 23.0	S18 06.4
Dubhe	194 25.3	N61 52.5
Elnath	278 47.2	N28 35.2
Eltanin	90 58.2	N51 29.7
Enif	34 13.4	N 9 46.4
Fomalhaut	15 53.6	S29 44.2
Gacrux	172 31.1	S56 59.5
Gienah	176 20.2	S17 25.1
Hadar	149 26.1	S60 16.1
Hamal	328 31.4	N23 21.3
Kaus Aust.	84 19.3	S34 23.6
Kochab	137 18.6	N74 15.2
Markab	14 05.1	N15 05.1
Menkar	314 43.5	N 4 00.1
Menkent	148 39.4	S36 15.7
Miaplacidus	221 46.1	S69 37.7
Mirfak	309 19.4	N49 46.7
Nunki	76 31.4	S26 19.4
Peacock	54 01.2	S56 48.2
Pollux	244 01.2	N28 04.8
Procyon	245 28.4	N 5 16.9
Rasalhague	96 31.3	N12 34.8
Regulus	208 12.5	N12 04.6
Rigel	281 38.4	S 8 13.7
Rigil Kent.	140 28.4	S60 44.7
Sabik	102 43.3	S15 41.8
Schedar	350 11.2	N56 24.6
Shaula	96 58.3	S37 05.2
Sirius	258 57.9	S16 41.2
Spica	158 59.8	S11 02.7
Suhail	223 12.7	S43 20.7
Vega	80 56.8	N38 46.0
Zuben'ubi	137 35.2	S15 56.9

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	294 31.1	8 59
Mars	305 22.5	8 15
Jupiter	278 13.5	10 03
Saturn	220 45.3	13 52

1977 JULY 12, 13, 14 (TUES., WED., THURS.)

G.M.T.		SUN G.H.A.	SUN Dec.	MOON G.H.A.	*v*	MOON Dec.	*d*	H.P.
d h		° ′	° ′	° ′	′	° ′	′	′
12 00		178 37.8	N22 01.0	229 50.3	12.8	N17 10.9	4.0	54.1
01		193 37.7	00.6	244 22.1	12.8	17 14.9	3.8	54.1
02		208 37.6	00.3	258 53.9	12.8	17 18.7	3.8	54.1
03		223 37.5	22 00.0	273 25.7	12.7	17 22.5	3.7	54.1
04		238 37.5	21 59.6	287 57.4	12.8	17 26.2	3.6	54.1
05		253 37.4	59.3	302 29.2	12.7	17 29.8	3.6	54.1
06		268 37.3	N21 58.9	317 00.9	12.7	N17 33.4	3.5	54.1
07		283 37.2	58.6	331 32.6	12.6	17 36.9	3.3	54.1
08	T	298 37.1	58.2	346 04.2	12.7	17 40.2	3.4	54.1
09	U	313 37.0	·· 57.9	0 35.9	12.6	17 43.6	3.2	54.1
10	E	328 37.0	57.5	15 07.5	12.6	17 46.8	3.1	54.1
11	S	343 36.9	57.2	29 39.1	12.6	17 49.9	3.1	54.1
12	D	358 36.8	N21 56.8	44 10.7	12.5	N17 53.0	3.0	54.1
13	A	13 36.7	56.5	58 42.2	12.5	17 56.0	2.9	54.1
14	Y	28 36.7	56.1	73 13.7	12.6	17 58.9	2.8	54.1
15		43 36.6	·· 55.8	87 45.3	12.5	18 01.7	2.8	54.1
16		58 36.5	55.4	102 16.8	12.4	18 04.5	2.7	54.1
17		73 36.4	55.1	116 48.2	12.5	18 07.2	2.5	54.1
18		88 36.3	N21 54.7	131 19.7	12.4	N18 09.7	2.5	54.1
19		103 36.3	54.4	145 51.1	12.4	18 12.2	2.5	54.1
20		118 36.2	54.0	160 22.5	12.4	18 14.7	2.3	54.1
21		133 36.1	·· 53.7	174 53.9	12.4	18 17.0	2.3	54.1
22		148 36.0	53.3	189 25.3	12.3	18 19.3	2.1	54.1
23		163 35.9	52.9	203 56.6	12.4	18 21.4	2.1	54.1
13 00		178 35.9	N21 52.6	218 28.0	12.3	N18 23.5	2.0	54.1
01		193 35.8	52.2	232 59.3	12.3	18 25.5	1.9	54.1
02		208 35.7	51.9	247 30.6	12.3	18 27.4	1.9	54.1
03		223 35.6	·· 51.5	262 01.9	12.2	18 29.3	1.7	54.1
04		238 35.6	51.1	276 33.1	12.3	18 31.0	1.7	54.1
05		253 35.5	50.8	291 04.4	12.2	18 32.7	1.6	54.1
06		268 35.4	N21 50.4	305 35.6	12.2	N18 34.3	1.5	54.1
07	W	283 35.3	50.1	320 06.8	12.2	18 35.8	1.4	54.1
08	E	298 35.3	49.7	334 38.0	12.2	18 37.2	1.3	54.1
09	D	313 35.2	·· 49.3	349 09.2	12.1	18 38.5	1.3	54.1
10	N	328 35.1	49.0	3 40.3	12.2	18 39.8	1.1	54.1
11	E	343 35.0	48.6	18 11.5	12.1	18 40.9	1.1	54.1
12	S	358 35.0	N21 48.2	32 42.6	12.1	N18 42.0	1.0	54.1
13	D	13 34.9	47.9	47 13.7	12.1	18 43.0	0.9	54.2
14	A	28 34.8	47.5	61 44.8	12.1	18 43.9	0.8	54.2
15	Y	43 34.7	·· 47.1	76 15.9	12.0	18 44.7	0.7	54.2
16		58 34.7	46.8	90 46.9	12.1	18 45.4	0.7	54.2
17		73 34.6	46.4	105 18.0	12.0	18 46.1	0.5	54.2
18		88 34.5	N21 46.0	119 49.0	12.0	N18 46.6	0.5	54.2
19		103 34.4	45.7	134 20.0	12.0	18 47.1	0.3	54.2
20		118 34.4	45.3	148 51.0	12.0	18 47.4	0.3	54.2
21		133 34.3	·· 44.9	163 22.0	12.0	18 47.7	0.2	54.2
22		148 34.2	44.6	177 53.0	12.0	18 47.9	0.1	54.2
23		163 34.1	44.2	192 24.0	11.9	18 48.0	0.1	54.2
14 00		178 34.1	N21 43.8	206 54.9	12.0	N18 48.1	0.1	54.2
01		193 34.0	43.4	221 25.9	11.9	18 48.0	0.1	54.2
02		208 33.9	43.1	235 56.8	11.9	18 47.9	0.3	54.2
03		223 33.9	·· 42.7	250 27.7	12.0	18 47.6	0.3	54.3
04		238 33.8	42.3	264 58.7	11.9	18 47.3	0.4	54.3
05		253 33.7	41.9	279 29.6	11.9	18 46.9	0.5	54.3
06		268 33.6	N21 41.6	294 00.5	11.9	N18 46.4	0.6	54.3
07		283 33.6	41.2	308 31.4	11.8	18 45.8	0.7	54.3
08	T	298 33.5	40.8	323 02.2	11.9	18 45.1	0.7	54.3
09	H	313 33.4	·· 40.4	337 33.1	11.9	18 44.4	0.9	54.3
10	U	328 33.4	40.0	352 04.0	11.8	18 43.5	0.9	54.3
11	R	343 33.3	39.7	6 34.8	11.9	18 42.6	1.1	54.3
12	S	358 33.2	N21 39.3	21 05.7	11.8	N18 41.5	1.1	54.3
13	D	13 33.2	38.9	35 36.5	11.8	18 40.4	1.2	54.4
14	A	28 33.1	38.5	50 07.3	11.9	18 39.2	1.3	54.4
15	Y	43 33.0	·· 38.1	64 38.2	11.8	18 37.9	1.4	54.4
16		58 32.9	37.7	79 09.0	11.8	18 36.5	1.4	54.4
17		73 32.9	37.4	93 39.8	11.8	18 35.1	1.6	54.4
18		88 32.8	N21 37.0	108 10.6	11.8	N18 33.5	1.7	54.4
19		103 32.7	36.6	122 41.4	11.8	18 31.8	1.7	54.4
20		118 32.7	36.2	137 12.2	11.8	18 30.1	1.8	54.4
21		133 32.6	·· 35.8	151 43.0	11.8	18 28.3	1.9	54.4
22		148 32.5	35.4	166 13.8	11.8	18 26.4	2.0	54.5
23		163 32.5	35.0	180 44.6	11.8	18 24.4	2.1	54.5
		S.D. 15.8	*d* 0.4	S.D. 14.7		14.8		14.8

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 12	Moonrise 13	Moonrise 14	Moonrise 15
°	h m	h m	h m	h m	h m	h m	h m
N 72	☐	☐	☐	☐	☐	☐	☐
N 70	☐	☐	☐	23 04	23 38	24 40	00 40
68	☐	☐	☐	23 46	24 25	00 25	01 23
66	////	////	01 25	24 15	00 15	00 56	01 52
64	////	////	02 09	00 04	00 36	01 19	02 14
62	////	00 29	02 38	00 20	00 54	01 37	02 31
60	////	01 38	02 59	00 33	01 08	01 52	02 46
N 58	////	02 11	03 17	00 44	01 21	02 05	02 58
56	00 26	02 35	03 32	00 54	01 31	02 16	03 09
54	01 30	02 53	03 44	01 02	01 41	02 26	03 18
52	02 00	03 09	03 55	01 10	01 49	02 35	03 27
50	02 23	03 22	04 05	01 17	01 57	02 43	03 34
45	03 02	03 49	04 25	01 32	02 13	02 59	03 50
N 40	03 30	04 10	04 42	01 44	02 26	03 13	04 03
35	03 51	04 27	04 56	01 54	02 38	03 24	04 14
30	04 09	04 41	05 08	02 03	02 47	03 34	04 24
20	04 35	05 04	05 28	02 19	03 04	03 52	04 41
N 10	04 56	05 23	05 46	02 33	03 19	04 07	04 56
0	05 14	05 40	06 02	02 46	03 33	04 21	05 09
S 10	05 30	05 56	06 18	02 59	03 47	04 35	05 23
20	05 44	06 12	06 35	03 13	04 02	04 51	05 38
30	05 59	06 29	06 55	03 29	04 19	05 08	05 55
35	06 07	06 39	07 06	03 39	04 30	05 18	06 04
40	06 16	06 49	07 19	03 49	04 41	05 30	06 15
45	06 25	07 02	07 35	04 02	04 54	05 44	06 29
S 50	06 35	07 16	07 53	04 17	05 11	06 00	06 44
52	06 40	07 23	08 02	04 25	05 19	06 08	06 52
54	06 45	07 30	08 12	04 33	05 27	06 17	07 00
56	06 50	07 38	08 23	04 42	05 37	06 27	07 10
58	06 56	07 47	08 36	04 52	05 48	06 38	07 20
S 60	07 03	07 57	08 52	05 03	06 01	06 51	07 32

Lat.	Sunset	Twilight Civil	Twilight Naut.	Moonset 12	Moonset 13	Moonset 14	Moonset 15
°	h m	h m	h m	h m	h m	h m	h m
N 72	☐	☐	☐	☐	☐	☐	22 28
N 70	☐	☐	☐	19 34	20 40	21 17	21 33
68	☐	☐	☐	18 52	19 52	20 34	21 00
66	22 42	////	////	18 24	19 21	20 05	20 36
64	22 00	////	////	18 03	18 58	19 43	20 17
62	21 32	23 32	////	17 45	18 40	19 25	20 01
60	21 11	22 31	////	17 31	18 25	19 11	19 48
N 58	20 53	21 59	////	17 19	18 12	18 58	19 37
56	20 39	21 35	23 35	17 08	18 01	18 47	19 27
54	20 26	21 17	22 39	16 59	17 51	18 38	19 18
52	20 15	21 01	22 09	16 51	17 43	18 29	19 10
50	20 06	20 48	21 47	16 43	17 35	18 22	19 03
45	19 45	20 21	21 08	16 27	17 18	18 05	18 48
N 40	19 29	20 01	20 41	16 14	17 05	17 52	18 36
35	19 15	19 44	20 20	16 03	16 53	17 41	18 25
30	19 03	19 30	20 03	15 54	16 43	17 31	18 16
20	18 43	19 07	19 36	15 37	16 26	17 13	18 00
N 10	18 26	18 48	19 15	15 22	16 11	16 58	17 46
0	18 09	18 32	18 57	15 09	15 56	16 44	17 33
S 10	17 53	18 16	18 42	14 55	15 42	16 30	17 20
20	17 36	18 00	18 27	14 41	15 27	16 15	17 05
30	17 17	17 43	18 12	14 24	15 10	15 58	16 49
35	17 05	17 33	18 04	14 14	14 59	15 48	16 40
40	16 52	17 22	17 56	14 03	14 48	15 36	16 29
45	16 37	17 10	17 47	13 51	14 34	15 23	16 16
S 50	16 18	16 56	17 36	13 35	14 18	15 06	16 01
52	16 09	16 49	17 32	13 27	14 10	14 58	15 53
54	15 59	16 42	17 27	13 19	14 01	14 50	15 45
56	15 48	16 34	17 21	13 10	13 51	14 40	15 36
58	15 35	16 25	17 16	13 00	13 40	14 29	15 26
S 60	15 20	16 14	17 09	12 48	13 27	14 16	15 14

Day	SUN Eqn. of Time 00ʰ	SUN Eqn. of Time 12ʰ	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	Age	Phase
	m s	m s	h m	h m	h m	d	
12	05 29	05 33	12 06	08 58	21 21	26	
13	05 36	05 40	12 06	09 45	22 09	27	🌘
14	05 44	05 47	12 06	10 33	22 57	28	

1977 JULY 15, 16, 17 (FRI., SAT., SUN.)

G.M.T.	ARIES	VENUS −3.7		MARS +1.2		JUPITER −1.5		SATURN +0.7	
	G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
d h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
15 00	292 43.9	224 59.4	N19 13.8	236 40.0	N19 05.5	210 29.3	N22 48.7	153 14.8	N16 45.9
01	307 46.4	239 59.0	14.3	251 40.6	05.9	225 31.2	48.7	168 17.0	45.8
02	322 48.9	254 58.6	14.8	266 41.3	06.3	240 33.1	48.7	183 19.2	45.8
03	337 51.3	269 58.3	· · 15.3	281 42.0	· · 06.7	255 34.9	· · 48.8	198 21.3	· · 45.7
04	352 53.8	284 57.9	15.8	296 42.6	07.1	270 36.8	48.8	213 23.5	45.6
05	7 56.3	299 57.5	16.2	311 43.3	07.6	285 38.7	48.8	228 25.7	45.5
06	22 58.7	314 57.1	N19 16.7	326 44.0	N19 08.0	300 40.6	N22 48.9	243 27.8	N16 45.4
07	38 01.2	329 56.7	17.2	341 44.6	08.4	315 42.5	48.9	258 30.0	45.3
08	53 03.7	344 56.4	17.7	356 45.3	08.8	330 44.3	48.9	273 32.2	45.2
F 09	68 06.1	359 56.0	· · 18.2	11 45.9	· · 09.2	345 46.2	· · 49.0	288 34.3	· · 45.1
R 10	83 08.6	14 55.6	18.7	26 46.6	09.6	0 48.1	49.0	303 36.5	45.0
I 11	98 11.0	29 55.2	19.2	41 47.3	10.1	15 50.0	49.0	318 38.6	44.9
D 12	113 13.5	44 54.8	N19 19.6	56 47.9	N19 10.5	30 51.9	N22 49.0	333 40.8	N16 44.9
A 13	128 16.0	59 54.4	20.1	71 48.6	10.9	45 53.7	49.1	348 43.0	44.8
Y 14	143 18.4	74 54.1	20.6	86 49.3	11.3	60 55.6	49.1	3 45.1	44.7
15	158 20.9	89 53.7	· · 21.1	101 49.9	· · 11.7	75 57.5	· · 49.1	18 47.3	· · 44.6
16	173 23.4	104 53.3	21.6	116 50.6	12.1	90 59.4	49.2	33 49.5	44.5
17	188 25.8	119 52.9	22.1	131 51.2	12.5	106 01.3	49.2	48 51.6	44.4
18	203 28.3	134 52.5	N19 22.5	146 51.9	N19 13.0	121 03.1	N22 49.2	63 53.8	N16 44.3
19	218 30.8	149 52.1	23.0	161 52.6	13.4	136 05.0	49.3	78 55.9	44.2
20	233 33.2	164 51.7	23.5	176 53.2	13.8	151 06.9	49.3	93 58.1	44.1
21	248 35.7	179 51.3	· · 24.0	191 53.9	· · 14.2	166 08.8	· · 49.3	109 00.3	· · 44.0
22	263 38.2	194 51.0	24.4	206 54.6	14.6	181 10.7	49.4	124 02.4	44.0
23	278 40.6	209 50.6	24.9	221 55.2	15.0	196 12.6	49.4	139 04.6	43.9
16 00	293 43.1	224 50.2	N19 25.4	236 55.9	N19 15.4	211 14.4	N22 49.4	154 06.8	N16 43.8
01	308 45.5	239 49.8	25.9	251 56.5	15.8	226 16.3	49.4	169 08.9	43.7
02	323 48.0	254 49.4	26.3	266 57.2	16.2	241 18.2	49.5	184 11.1	43.6
03	338 50.5	269 49.0	· · 26.8	281 57.9	· · 16.7	256 20.1	· · 49.5	199 13.2	· · 43.5
04	353 52.9	284 48.6	27.3	296 58.5	17.1	271 22.0	49.5	214 15.4	43.4
05	8 55.4	299 48.2	27.8	311 59.2	17.5	286 23.9	49.6	229 17.6	43.3
06	23 57.9	314 47.8	N19 28.2	326 59.9	N19 17.9	301 25.7	N22 49.6	244 19.7	N16 43.2
07	39 00.3	329 47.4	28.7	342 00.5	18.3	316 27.6	49.6	259 21.9	43.1
S 08	54 02.8	344 47.0	29.2	357 01.2	18.7	331 29.5	49.7	274 24.1	43.1
A 09	69 05.3	359 46.6	· · 29.6	12 01.8	· · 19.1	346 31.4	· · 49.7	289 26.2	· · 43.0
T 10	84 07.7	14 46.2	30.1	27 02.5	19.5	1 33.3	49.7	304 28.4	42.9
U 11	99 10.2	29 45.8	30.6	42 03.2	19.9	16 35.2	49.7	319 30.5	42.8
R 12	114 12.6	44 45.4	N19 31.0	57 03.8	N19 20.3	31 37.0	N22 49.8	334 32.7	N16 42.7
D 13	129 15.1	59 45.0	31.5	72 04.5	20.7	46 38.9	49.8	349 34.9	42.6
A 14	144 17.6	74 44.6	32.0	87 05.2	21.1	61 40.8	49.8	4 37.0	42.5
Y 15	159 20.0	89 44.2	· · 32.4	102 05.8	· · 21.5	76 42.7	· · 49.9	19 39.2	· · 42.4
16	174 22.5	104 43.8	32.9	117 06.5	21.9	91 44.6	49.9	34 41.4	42.3
17	189 25.0	119 43.4	33.4	132 07.2	22.4	106 46.5	49.9	49 43.5	42.2
18	204 27.4	134 43.0	N19 33.8	147 07.8	N19 22.8	121 48.3	N22 50.0	64 45.7	N16 42.1
19	219 29.9	149 42.6	34.3	162 08.5	23.2	136 50.2	50.0	79 47.8	42.1
20	234 32.4	164 42.2	34.8	177 09.1	23.6	151 52.1	50.0	94 50.0	42.0
21	249 34.8	179 41.8	· · 35.2	192 09.8	· · 24.0	166 54.0	· · 50.0	109 52.2	· · 41.9
22	264 37.3	194 41.4	35.7	207 10.5	24.4	181 55.9	50.1	124 54.3	41.8
23	279 39.8	209 41.0	36.2	222 11.1	24.8	196 57.8	50.1	139 56.5	41.7
17 00	294 42.2	224 40.6	N19 36.6	237 11.8	N19 25.2	211 59.6	N22 50.1	154 58.6	N16 41.6
01	309 44.7	239 40.2	37.1	252 12.5	25.6	227 01.5	50.2	170 00.8	41.5
02	324 47.1	254 39.8	37.5	267 13.1	26.0	242 03.4	50.2	185 03.0	41.4
03	339 49.6	269 39.4	· · 38.0	282 13.8	· · 26.4	257 05.3	· · 50.2	200 05.1	· · 41.3
04	354 52.1	284 39.0	38.4	297 14.4	26.8	272 07.2	50.2	215 07.3	41.2
05	9 54.5	299 38.6	38.9	312 15.1	27.2	287 09.1	50.3	230 09.4	41.2
06	24 57.0	314 38.2	N19 39.4	327 15.8	N19 27.6	302 11.0	N22 50.3	245 11.6	N16 41.1
07	39 59.5	329 37.8	39.8	342 16.4	28.0	317 12.8	50.3	260 13.8	41.0
08	55 01.9	344 37.4	40.3	357 17.1	28.4	332 14.7	50.4	275 15.9	40.9
S 09	70 04.4	359 37.0	· · 40.7	12 17.8	· · 28.8	347 16.6	· · 50.4	290 18.1	· · 40.8
U 10	85 06.9	14 36.5	41.2	27 18.4	29.2	2 18.5	50.4	305 20.3	40.7
N 11	100 09.3	29 36.1	41.6	42 19.1	29.6	17 20.4	50.5	320 22.4	40.6
D 12	115 11.8	44 35.7	N19 42.1	57 19.7	N19 30.0	32 22.3	N22 50.5	335 24.6	N16 40.5
A 13	130 14.3	59 35.3	42.5	72 20.4	30.4	47 24.2	50.5	350 26.7	40.4
Y 14	145 16.7	74 34.9	43.0	87 21.1	30.8	62 26.0	50.5	5 28.9	40.3
15	160 19.2	89 34.5	· · 43.4	102 21.7	· · 31.2	77 27.9	· · 50.6	20 31.1	· · 40.2
16	175 21.6	104 34.1	43.9	117 22.4	31.6	92 29.8	50.6	35 33.2	40.2
17	190 24.1	119 33.7	44.3	132 23.1	32.0	107 31.7	50.6	50 35.4	40.1
18	205 26.6	134 33.2	N19 44.8	147 23.7	N19 32.4	122 33.6	N22 50.7	65 37.5	N16 40.0
19	220 29.0	149 32.8	45.2	162 24.4	32.8	137 35.5	50.7	80 39.7	39.9
20	235 31.5	164 32.4	45.7	177 25.0	33.2	152 37.4	50.7	95 41.9	39.8
21	250 34.0	179 32.0	· · 46.1	192 25.7	· · 33.6	167 39.2	· · 50.7	110 44.0	· · 39.7
22	265 36.4	194 31.6	46.6	207 26.4	34.0	182 41.1	50.8	125 46.2	39.6
23	280 38.9	209 31.2	47.0	222 27.0	34.4	197 43.0	50.8	140 48.3	39.5
Mer. Pass.	h m 4 24.4	v −0.4	d 0.5	v 0.7	d 0.4	v 1.9	d 0.0	v 2.2	d 0.1

STARS		
Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 39.1	S40 23.5
Achernar	335 47.0	S57 20.7
Acrux	173 39.7	S62 58.8
Adhara	255 34.1	S28 56.5
Aldebaran	291 20.7	N16 27.8
Alioth	166 44.6	N56 05.2
Alkaid	153 20.2	N49 25.8
Al Na'ir	28 17.3	S47 03.9
Alnilam	276 14.1	S 1 13.0
Alphard	218 22.9	S 8 33.7
Alphecca	126 33.7	N26 47.6
Alpheratz	358 11.3	N28 57.9
Altair	62 34.3	N 8 48.7
Ankaa	353 42.3	S42 25.4
Antares	112 59.2	S26 22.9
Arcturus	146 20.3	N19 18.1
Atria	108 24.8	S68 59.4
Avior	234 29.6	S59 26.4
Bellatrix	279 01.3	N 6 19.7
Betelgeuse	271 30.9	N 7 24.1
Canopus	264 08.7	S52 41.0
Capella	281 14.8	N45 58.4
Deneb	49 49.4	N45 12.1
Denebola	183 01.4	N14 41.9
Diphda	349 22.9	S18 06.4
Dubhe	194 25.3	N61 52.5
Elnath	278 47.1	N28 35.2
Eltanin	90 58.2	N51 29.8
Enif	34 13.4	N 9 46.4
Fomalhaut	15 53.6	S29 44.2
Gacrux	172 31.2	S56 59.5
Gienah	176 20.2	S17 25.1
Hadar	149 26.1	S60 16.1
Hamal	328 31.3	N23 21.3
Kaus Aust.	84 19.3	S34 23.7
Kochab	137 18.6	N74 15.2
Markab	14 05.1	N15 05.1
Menkar	314 43.5	N 4 00.1
Menkent	148 39.4	S36 15.7
Miaplacidus	221 46.1	S69 37.7
Mirfak	309 19.3	N49 46.7
Nunki	76 31.4	S26 19.4
Peacock	54 01.2	S56 48.3
Pollux	244 01.1	N28 04.8
Procyon	245 28.3	N 5 16.9
Rasalhague	96 31.3	N12 34.8
Regulus	208 12.5	N12 04.6
Rigel	281 38.3	S 8 13.7
Rigil Kent.	140 28.4	S60 44.7
Sabik	102 43.3	S15 41.8
Schedar	350 11.2	N56 24.6
Shaula	96 58.3	S37 05.2
Sirius	258 57.9	S16 41.2
Spica	158 59.8	S11 02.7
Suhail	223 12.7	S43 20.7
Vega	80 56.8	N38 46.0
Zuben'ubi	137 35.3	S15 56.9

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	291 07.1	9 01
Mars	303 12.8	8 12
Jupiter	277 31.4	9 54
Saturn	220 23.7	13 42

	G.M.T.	SUN G.H.A.	SUN Dec.	MOON G.H.A.	MOON v	MOON Dec.	MOON d	MOON H.P.
	d h	° ′	° ′	° ′	′	° ′	′	′
	15 00	178 32.4	N21 34.7	195 15.4	11.8	N18 22.3	2.2	54.5
	01	193 32.3	34.3	209 46.2	11.8	18 20.1	2.3	54.5
	02	208 32.3	33.9	224 17.0	11.8	18 17.8	2.3	54.5
	03	223 32.2	·· 33.5	238 47.8	11.7	18 15.5	2.5	54.5
	04	238 32.1	33.1	253 18.5	11.8	18 13.0	2.5	54.5
	05	253 32.1	32.7	267 49.3	11.8	18 10.5	2.6	54.5
	06	268 32.0	N21 32.3	282 20.1	11.8	N18 07.9	2.7	54.5
	07	283 31.9	31.9	296 50.9	11.8	18 05.2	2.8	54.6
	08	298 31.9	31.5	311 21.7	11.8	18 02.4	2.9	54.6
F	09	313 31.8	·· 31.1	325 52.5	11.7	17 59.5	2.9	54.6
R	10	328 31.7	30.7	340 23.2	11.8	17 56.6	3.1	54.6
I	11	343 31.7	30.3	354 54.0	11.8	17 53.5	3.1	54.6
D	12	358 31.6	N21 29.9	9 24.8	11.8	N17 50.4	3.2	54.6
A	13	13 31.5	29.6	23 55.6	11.8	17 47.2	3.3	54.6
Y	14	28 31.5	29.2	38 26.4	11.8	17 43.9	3.4	54.7
	15	43 31.4	·· 28.8	52 57.2	11.8	17 40 5	3.5	54.7
	16	58 31.4	28.4	67 28.0	11.8	17 37.0	3.6	54.7
	17	73 31.3	28.0	81 58.8	11.8	17 33.4	3.6	54.7
	18	88 31.2	N21 27.6	96 29.6	11.8	N17 29.8	3.8	54.7
	19	103 31.2	27.2	111 00.4	11.9	17 26.0	3.8	54.7
	20	118 31.1	26.8	125 31.3	11.8	17 22.2	3.9	54.7
	21	133 31.0	·· 26.4	140 02.1	11.8	17 18.3	4.0	54.8
	22	148 31.0	26.0	154 32.9	11.8	17 14.3	4.1	54.8
	23	163 30.9	25.5	169 03.7	11.9	17 10.2	4.1	54.8
	16 00	178 30.8	N21 25.1	183 34.6	11.8	N17 06.1	4.3	54.8
	01	193 30.8	24.7	198 05.4	11.9	17 01.8	4.3	54.8
	02	208 30.7	24.3	212 36.3	11.8	16 57.5	4.4	54.8
	03	223 30.7	·· 23.9	227 07.1	11.9	16 53.1	4.5	54.8
	04	238 30.6	23.5	241 38.0	11.9	16 48.6	4.6	54.9
	05	253 30.5	23.1	256 08.9	11.9	16 44.0	4.6	54.9
	06	268 30.5	N21 22.7	270 39.8	11.9	N16 39.4	4.8	54.9
	07	283 30.4	22.3	285 10.7	11.8	16 34.6	4.8	54.9
S	08	298 30.4	21.9	299 41.5	12.0	16 29.8	4.9	54.9
A	09	313 30.3	·· 21.5	314 12.5	11.9	16 24.9	5.0	54.9
T	10	328 30.2	21.1	328 43.4	11.9	16 19.9	5.0	55.0
U	11	343 30.2	20.7	343 14.3	11.9	16 14.9	5.2	55.0
R	12	358 30.1	N21 20.3	357 45.2	12.0	N16 09.7	5.2	55.0
D	13	13 30.1	19.8	12 16.2	11.9	16 04.5	5.3	55.0
A	14	28 30.0	19.4	26 47.1	12.0	15 59.2	5.4	55.0
Y	15	43 29.9	·· 19.0	41 18.1	11.9	15 53.8	5.4	55.0
	16	58 29.9	18.6	55 49.0	12.0	15 48.4	5.6	55.0
	17	73 29.8	18.2	70 20.0	12.0	15 42.8	5.6	55.1
	18	88 29.8	N21 17.8	84 51.0	12.0	N15 37.2	5.7	55.1
	19	103 29.7	17.4	99 22.0	12.0	15 31.5	5.8	55.1
	20	118 29.7	16.9	113 53.0	12.0	15 25.7	5.8	55.1
	21	133 29.6	·· 16.5	128 24.0	12.1	15 19.9	5.9	55.1
	22	148 29.5	16.1	142 55.1	12.0	15 14.0	6.0	55.1
	23	163 29.5	15.7	157 26.1	12.1	15 08.0	6.1	55.2
	17 00	178 29.4	N21 15.3	171 57.2	12.0	N15 01.9	6.2	55.2
	01	193 29.4	14.8	186 28.2	12.1	14 55.7	6.2	55.2
	02	208 29.3	14.4	200 59.3	12.1	14 49.5	6.3	55.2
	03	223 29.3	·· 14.0	215 30.4	12.1	14 43.2	6.4	55.2
	04	238 29.2	13.6	230 01.5	12.1	14 36.8	6.4	55.3
	05	253 29.1	13.2	244 32.6	12.1	14 30.4	6.5	55.3
	06	268 29.1	N21 12.7	259 03.7	12.1	N14 23.9	6.6	55.3
	07	283 29.0	12.3	273 34.8	12.2	14 17.3	6.7	55.3
	08	298 29.0	11.9	288 06.0	12.1	14 10.6	6.7	55.3
S	09	313 28.9	·· 11.5	302 37.1	12.2	14 03.9	6.8	55.3
U	10	328 28.9	11.0	317 08.3	12.2	13 57.1	6.9	55.4
N	11	343 28.8	10.6	331 39.5	12.2	13 50.2	6.9	55.4
D	12	358 28.8	N21 10.2	346 10.7	12.2	N13 43.3	7.1	55.4
A	13	13 28.7	09.8	0 41.9	12.2	13 36.2	7.1	55.4
Y	14	28 28.7	09.3	15 13.1	12.2	13 29.1	7.1	55.4
	15	43 28.6	·· 08.9	29 44.3	12.2	13 22.0	7.2	55.5
	16	58 28.6	08.5	44 15.5	12.3	13 14.8	7.3	55.5
	17	73 28.5	08.1	58 46.8	12.2	13 07.5	7.4	55.5
	18	88 28.4	N21 07.6	73 18.0	12.3	N13 00.1	7.4	55.5
	19	103 28.4	07.2	87 49.3	12.3	12 52.7	7.5	55.5
	20	118 28.3	06.8	102 20.6	12.3	12 45.2	7.5	55.5
	21	133 28.3	·· 06.3	116 51.9	12.3	12 37.7	7.7	55.6
	22	148 28.2	05.9	131 23.2	12.3	12 30.0	7.6	55.6
	23	163 28.2	05.5	145 54.5	12.3	12 22.4	7.8	55.6
		S.D. 15.8	d 0.4	S.D. 14.9		15.0		15.1

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 15	Moonrise 16	Moonrise 17	Moonrise 18
°	h m	h m	h m	h m	h m	h m	h m
N 72	☐	☐	☐	☐	01 10	03 05	04 53
N 70	☐	☐	☐	00 40	02 04	03 37	05 13
68	☐	☐	☐	01 23	02 37	04 01	05 29
66	////	////	01 39	01 52	03 01	04 19	05 42
64	////	////	02 18	02 14	03 20	04 33	05 52
62	////	00 56	02 44	02 31	03 35	04 46	06 01
60	////	01 47	03 05	02 46	03 48	04 56	06 09
N 58	////	02 18	03 22	02 58	03 59	05 05	06 16
56	00 51	02 40	03 36	03 09	04 08	05 13	06 22
54	01 39	02 58	03 48	03 18	04 17	05 20	06 27
52	02 07	03 13	03 59	03 27	04 24	05 26	06 32
50	02 28	03 26	04 08	03 34	04 31	05 32	06 36
45	03 06	03 52	04 28	03 50	04 45	05 44	06 46
N 40	03 33	04 12	04 44	04 03	04 57	05 54	06 53
35	03 53	04 29	04 58	04 14	05 08	06 03	07 00
30	04 10	04 43	05 09	04 24	05 16	06 11	07 06
20	04 37	05 05	05 29	04 41	05 32	06 24	07 16
N 10	04 57	05 24	05 46	04 56	05 45	06 35	07 25
0	05 14	05 40	06 02	05 09	05 58	06 46	07 33
S 10	05 30	05 56	06 18	05 23	06 10	06 56	07 41
20	05 44	06 11	06 35	05 38	06 24	07 08	07 50
30	05 59	06 28	06 54	05 55	06 39	07 21	08 00
35	06 06	06 37	07 05	06 04	06 48	07 28	08 06
40	06 14	06 48	07 18	06 15	06 58	07 37	08 13
45	06 23	07 00	07 33	06 29	07 09	07 46	08 20
S 50	06 33	07 14	07 51	06 44	07 24	07 58	08 29
52	06 38	07 20	07 59	06 52	07 30	08 04	08 34
54	06 43	07 27	08 09	07 00	07 38	08 10	08 38
56	06 48	07 35	08 20	07 10	07 46	08 17	08 43
58	06 53	07 44	08 32	07 20	07 55	08 24	08 49
S 60	06 59	07 54	08 47	07 32	08 06	08 33	08 55

Lat.	Sunset	Twilight Civil	Twilight Naut.	Moonset 15	Moonset 16	Moonset 17	Moonset 18
°	h m	h m	h m	h m	h m	h m	h m
N 72	☐	☐	☐	22 28	22 13	22 05	21 57
N 70	☐	☐	☐	21 33	21 40	21 43	21 44
68	☐	☐	☐	21 00	21 16	21 26	21 33
66	22 29	////	////	20 36	20 57	21 12	21 24
64	21 52	////	////	20 17	20 42	21 01	21 16
62	21 26	23 10	////	20 01	20 29	20 51	21 09
60	21 06	22 22	////	19 48	20 18	20 43	21 03
N 58	20 49	21 52	////	19 37	20 09	20 35	20 58
56	20 35	21 30	23 15	19 27	20 00	20 29	20 54
54	20 23	21 12	22 31	19 18	19 53	20 23	20 49
52	20 12	20 58	22 04	19 10	19 46	20 18	20 46
50	20 03	20 45	21 43	19 03	19 40	20 13	20 42
45	19 43	20 19	21 05	18 48	19 27	20 02	20 35
N 40	19 27	19 59	20 39	18 36	19 16	19 54	20 29
35	19 14	19 43	20 18	18 25	19 07	19 46	20 23
30	19 02	19 29	20 01	18 16	18 59	19 40	20 18
20	18 42	19 07	19 35	18 00	18 45	19 28	20 10
N 10	18 25	18 48	19 15	17 46	18 32	19 18	20 03
0	18 10	18 32	18 58	17 33	18 21	19 09	19 56
S 10	17 54	18 16	18 42	17 20	18 09	18 59	19 49
20	17 37	18 01	18 28	17 05	17 57	18 49	19 41
30	17 18	17 44	18 13	16 49	17 42	18 37	19 33
35	17 07	17 35	18 06	16 40	17 34	18 30	19 28
40	16 55	17 24	17 58	16 29	17 24	18 22	19 22
45	16 40	17 13	17 49	16 16	17 13	18 13	19 16
S 50	16 21	16 59	17 39	16 01	17 00	18 02	19 08
52	16 13	16 52	17 35	15 53	16 53	17 57	19 04
54	16 03	16 45	17 30	15 45	16 46	17 52	19 00
56	15 52	16 37	17 25	15 36	16 38	17 45	18 55
58	15 40	16 29	17 19	15 26	16 29	17 38	18 50
S 60	15 25	16 19	17 13	15 14	16 19	17 30	18 45

Day	SUN Eqn. of Time 00ʰ	SUN Eqn. of Time 12ʰ	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	Age	Phase
	m s	m s	h m	h m	h m	d	
15	05 50	05 53	12 06	11 21	23 45	29	●
16	05 56	05 59	12 06	12 09	24 33	00	
17	06 02	06 05	12 06	12 57	00 33	01	

	G.M.T.	ARIES	VENUS −3.7		MARS +1.2		JUPITER −1.6		SATURN +0.7	
		G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
	d h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
	18 00	295 41.4	224 30.7	N19 47.4	237 27.7	N19 34.8	212 44.9	N22 50.8	155 50.5	N16 39.4
	01	310 43.8	239 30.3	47.9	252 28.4	35.2	227 46.8	50.9	170 52.7	39.3
	02	325 46.3	254 29.9	48.3	267 29.0	35.5	242 48.7	50.9	185 54.8	39.2
	03	340 48.7	269 29.5	· · 48.8	282 29.7	· · 35.9	257 50.6	· · 50.9	200 57.0	· · 39.2
	04	355 51.2	284 29.1	49.2	297 30.4	36.3	272 52.5	50.9	215 59.1	39.1
	05	10 53.7	299 28.6	49.6	312 31.0	36.7	287 54.3	51.0	231 01.3	39.0
	06	25 56.1	314 28.2	N19 50.1	327 31.7	N19 37.1	302 56.2	N22 51.0	246 03.5	N16 38.9
	07	40 58.6	329 27.8	50.5	342 32.3	37.5	317 58.1	51.0	261 05.6	38.8
	08	56 01.1	344 27.4	51.0	357 33.0	37.9	333 00.0	51.1	276 07.8	38.7
M	09	71 03.5	359 26.9	· · 51.4	12 33.7	· · 38.3	348 01.9	· · 51.1	291 09.9	· · 38.6
O	10	86 06.0	14 26.5	51.8	27 34.3	38.7	3 03.8	51.1	306 12.1	38.5
N	11	101 08.5	29 26.1	52.3	42 35.0	39.1	18 05.7	51.1	321 14.3	38.4
D	12	116 10.9	44 25.7	N19 52.7	57 35.7	N19 39.5	33 07.6	N22 51.2	336 16.4	N16 38.3
A	13	131 13.4	59 25.2	53.1	72 36.3	39.9	48 09.4	51.2	351 18.6	38.2
Y	14	146 15.9	74 24.8	53.6	87 37.0	40.3	63 11.3	51.2	6 20.7	38.1
	15	161 18.3	89 24.4	· · 54.0	102 37.6	· · 40.6	78 13.2	· · 51.2	21 22.9	· · 38.1
	16	176 20.8	104 24.0	54.4	117 38.3	41.0	93 15.1	51.3	36 25.1	38.0
	17	191 23.2	119 23.5	54.9	132 39.0	41.4	108 17.0	51.3	51 27.2	37.9
	18	206 25.7	134 23.1	N19 55.3	147 39.6	N19 41.8	123 18.9	N22 51.3	66 29.4	N16 37.8
	19	221 28.2	149 22.7	55.7	162 40.3	42.2	138 20.8	51.4	81 31.5	37.7
	20	236 30.6	164 22.3	56.2	177 41.0	42.6	153 22.7	51.4	96 33.7	37.6
	21	251 33.1	179 21.8	· · 56.6	192 41.6	· · 43.0	168 24.5	· · 51.4	111 35.9	· · 37.5
	22	266 35.6	194 21.4	57.0	207 42.3	43.4	183 26.4	51.4	126 38.0	37.4
	23	281 38.0	209 21.0	57.4	222 43.0	43.8	198 28.3	51.5	141 40.2	37.3
	19 00	296 40.5	224 20.5	N19 57.9	237 43.6	N19 44.1	213 30.2	N22 51.5	156 42.3	N16 37.2
	01	311 43.0	239 20.1	58.3	252 44.3	44.5	228 32.1	51.5	171 44.5	37.1
	02	326 45.4	254 19.7	58.7	267 44.9	44.9	243 34.0	51.5	186 46.7	37.0
	03	341 47.9	269 19.2	· · 59.1	282 45.6	· · 45.3	258 35.9	· · 51.6	201 48.8	· · 37.0
	04	356 50.4	284 18.8	19 59.6	297 46.3	45.7	273 37.8	51.6	216 51.0	36.9
	05	11 52.8	299 18.4	20 00.0	312 46.9	46.1	288 39.7	51.6	231 53.1	36.8
	06	26 55.3	314 17.9	N20 00.4	327 47.6	N19 46.5	303 41.6	N22 51.7	246 55.3	N16 36.7
	07	41 57.7	329 17.5	00.8	342 48.3	46.8	318 43.4	51.7	261 57.4	36.6
	08	57 00.2	344 17.1	01.3	357 48.9	47.2	333 45.3	51.7	276 59.6	36.5
T	09	72 02.7	359 16.6	· · 01.7	12 49.6	· · 47.6	348 47.2	· · 51.7	292 01.8	· · 36.4
U	10	87 05.1	14 16.2	02.1	27 50.3	48.0	3 49.1	51.8	307 03.9	36.3
E	11	102 07.6	29 15.7	02.5	42 50.9	48.4	18 51.0	51.8	322 06.1	36.2
S	12	117 10.1	44 15.3	N20 02.9	57 51.6	N19 48.8	33 52.9	N22 51.8	337 08.2	N16 36.1
D	13	132 12.5	59 14.9	03.3	72 52.2	49.1	48 54.8	51.8	352 10.4	36.0
A	14	147 15.0	74 14.4	03.8	87 52.9	49.5	63 56.7	51.9	7 12.6	35.9
Y	15	162 17.5	89 14.0	· · 04.2	102 53.6	· · 49.9	78 58.6	· · 51.9	22 14.7	· · 35.9
	16	177 19.9	104 13.5	04.6	117 54.2	50.3	94 00.5	51.9	37 16.9	35.8
	17	192 22.4	119 13.1	05.0	132 54.9	50.7	109 02.3	52.0	52 19.0	35.7
	18	207 24.8	134 12.7	N20 05.4	147 55.6	N19 51.1	124 04.2	N22 52.0	67 21.2	N16 35.6
	19	222 27.3	149 12.2	05.8	162 56.2	51.4	139 06.1	52.0	82 23.4	35.5
	20	237 29.8	164 11.8	06.2	177 56.9	51.8	154 08.0	52.0	97 25.5	35.4
	21	252 32.2	179 11.3	· · 06.7	192 57.6	· · 52.2	169 09.9	· · 52.1	112 27.7	· · 35.3
	22	267 34.7	194 10.9	07.1	207 58.2	52.6	184 11.8	52.1	127 29.8	35.2
	23	282 37.2	209 10.4	07.5	222 58.9	53.0	199 13.7	52.1	142 32.0	35.1
	20 00	297 39.6	224 10.0	N20 07.9	237 59.5	N19 53.3	214 15.6	N22 52.1	157 34.1	N16 35.0
	01	312 42.1	239 09.6	08.3	253 00.2	53.7	229 17.5	52.2	172 36.3	34.9
	02	327 44.6	254 09.1	08.7	268 00.9	54.1	244 19.4	52.2	187 38.5	34.8
	03	342 47.0	269 08.7	· · 09.1	283 01.5	· · 54.5	259 21.3	· · 52.2	202 40.6	· · 34.8
	04	357 49.5	284 08.2	09.5	298 02.2	54.9	274 23.2	52.2	217 42.8	34.7
	05	12 52.0	299 07.8	09.9	313 02.9	55.2	289 25.0	52.3	232 44.9	34.6
	06	27 54.4	314 07.3	N20 10.3	328 03.5	N19 55.6	304 26.9	N22 52.3	247 47.1	N16 34.5
W	07	42 56.9	329 06.9	10.7	343 04.2	56.0	319 28.8	52.3	262 49.2	34.4
E	08	57 59.3	344 06.4	11.1	358 04.9	56.4	334 30.7	52.3	277 51.4	34.3
D	09	73 01.8	359 06.0	· · 11.5	13 05.5	· · 56.7	349 32.6	· · 52.4	292 53.6	· · 34.2
N	10	88 04.3	14 05.5	11.9	28 06.2	57.1	4 34.5	52.4	307 55.7	34.1
E	11	103 06.7	29 05.1	12.3	43 06.8	57.5	19 36.4	52.4	322 57.9	34.0
S	12	118 09.2	44 04.6	N20 12.7	58 07.5	N19 57.9	34 38.3	N22 52.5	338 00.0	N16 33.9
D	13	133 11.7	59 04.2	13.1	73 08.2	58.2	49 40.2	52.5	353 02.2	33.8
A	14	148 14.1	74 03.7	13.5	88 08.8	58.6	64 42.1	52.5	8 04.4	33.7
Y	15	163 16.6	89 03.3	· · 13.9	103 09.5	· · 59.0	79 44.0	· · 52.5	23 06.5	· · 33.6
	16	178 19.1	104 02.8	14.3	118 10.2	59.4	94 45.9	52.6	38 08.7	33.6
	17	193 21.5	119 02.4	14.7	133 10.8	19 59.7	109 47.8	52.6	53 10.8	33.5
	18	208 24.0	134 01.9	N20 15.1	148 11.5	N20 00.1	124 49.7	N22 52.6	68 13.0	N16 33.4
	19	223 26.5	149 01.5	15.5	163 12.2	00.5	139 51.5	52.6	83 15.1	33.3
	20	238 28.9	164 01.0	15.9	178 12.8	00.9	154 53.4	52.7	98 17.3	33.2
	21	253 31.4	179 00.5	· · 16.3	193 13.5	· · 01.2	169 55.3	· · 52.7	113 19.5	· · 33.1
	22	268 33.8	194 00.1	16.7	208 14.1	01.6	184 57.2	52.7	128 21.6	33.0
	23	283 36.3	208 59.6	17.1	223 14.8	02.0	199 59.1	52.7	143 23.8	32.9
	Mer. Pass.	h m 4 12.6	*v* −0.4	*d* 0.4	*v* 0.7	*d* 0.4	*v* 1.9	*d* 0.0	*v* 2.2	*d* 0.1

STARS		
Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 39.0	S40 23.5
Achernar	335 46.9	S57 20.7
Acrux	173 39.7	S62 58.8
Adhara	255 34.1	S28 56.5
Aldebaran	291 20.7	N16 27.8
Alioth	166 44.6	N56 05.2
Alkaid	153 20.2	N49 25.8
Al Na'ir	28 17.3	S47 03.9
Alnilam	276 14.1	S 1 13.0
Alphard	218 22.9	S 8 33.7
Alphecca	126 33.7	N26 47.7
Alpheratz	358 11.3	N28 57.9
Altair	62 34.2	N 8 48.7
Ankaa	353 42.2	S42 25.4
Antares	112 59.2	S26 22.9
Arcturus	146 20.4	N19 18.1
Atria	108 24.9	S68 59.4
Avior	234 29.6	S59 26.4
Bellatrix	279 01.3	N 6 19.7
Betelgeuse	271 30.9	N 7 24.1
Canopus	264 08.7	S52 41.0
Capella	281 14.8	N45 58.4
Deneb	49 49.4	N45 12.1
Denebola	183 01.4	N14 41.9
Diphda	349 22.9	S18 06.4
Dubhe	194 25.3	N61 52.5
Elnath	278 47.1	N28 35.2
Eltanin	90 58.2	N51 29.8
Enif	34 13.4	N 9 46.4
Fomalhaut	15 53.5	S29 44.2
Gacrux	172 31.2	S56 59.5
Gienah	176 20.2	S17 25.1
Hadar	149 26.2	S60 16.1
Hamal	328 31.3	N23 21.3
Kaus Aust.	84 19.3	S34 23.7
Kochab	137 18.7	N74 15.2
Markab	14 05.0	N15 05.1
Menkar	314 43.5	N 4 00.1
Menkent	148 39.4	S36 15.7
Miaplacidus	221 46.1	S69 37.7
Mirfak	309 19.3	N49 46.7
Nunki	76 31.4	S26 19.4
Peacock	54 01.2	S56 48.3
Pollux	244 01.1	N28 04.8
Procyon	245 28.3	N 5 16.9
Rasalhague	96 31.3	N12 34.8
Regulus	208 12.5	N12 04.6
Rigel	281 38.3	S 8 13.6
Rigil Kent.	140 28.4	S60 44.7
Sabik	102 43.3	S15 41.8
Schedar	350 11.2	N56 24.7
Shaula	96 58.3	S37 05.2
Sirius	258 57.9	S16 41.2
Spica	158 59.8	S11 02.7
Suhail	223 12.7	S43 20.7
Vega	80 56.8	N38 46.0
Zuben'ubi	137 35.3	S15 56.9

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	287 40.0	9 03
Mars	301 03.1	8 09
Jupiter	276 49.7	9 45
Saturn	220 01.8	13 31

G.M.T.	SUN G.H.A.	SUN Dec.	MOON G.H.A.	MOON v	MOON Dec.	MOON d	MOON H.P.
d h	° ′	° ′	° ′	′	° ′	′	′
18 00	178 28.1	N21 05.0	160 25.8	12.3	N12 14.6	7.8	55.6
01	193 28.1	04.6	174 57.1	12.4	12 06.8	7.9	55.6
02	208 28.0	04.2	189 28.5	12.3	11 58.9	7.9	55.7
03	223 28.0	·· 03.7	203 59.8	12.4	11 51.0	8.0	55.7
04	238 27.9	03.3	218 31.2	12.4	11 43.0	8.1	55.7
05	253 27.9	02.8	233 02.6	12.4	11 34.9	8.1	55.7
06	268 27.8	N21 02.4	247 34.0	12.3	N11 26.8	8.1	55.7
07	283 27.8	02.0	262 05.3	12.4	11 18.7	8.3	55.8
08	298 27.7	01.5	276 36.7	12.5	11 10.4	8.3	55.8
M 09	313 27.7	·· 01.1	291 08.2	12.4	11 02.1	8.3	55.8
O 10	328 27.6	00.7	305 39.6	12.4	10 53.8	8.4	55.8
N 11	343 27.6	21 00.2	320 11.0	12.4	10 45.4	8.5	55.8
D 12	358 27.5	N20 59.8	334 42.4	12.5	N10 36.9	8.5	55.9
A 13	13 27.5	59.3	349 13.9	12.4	10 28.4	8.6	55.9
Y 14	28 27.5	58.9	3 45.3	12.5	10 19.8	8.6	55.9
15	43 27.4	·· 58.4	18 16.8	12.5	10 11.2	8.7	55.9
16	58 27.4	58.0	32 48.3	12.5	10 02.5	8.7	55.9
17	73 27.3	57.6	47 19.8	12.4	9 53.8	8.8	56.0
18	88 27.3	N20 57.1	61 51.2	12.5	N 9 45.0	8.9	56.0
19	103 27.2	56.7	76 22.7	12.5	9 36.1	8.9	56.0
20	118 27.2	56.2	90 54.2	12.5	9 27.2	8.9	56.0
21	133 27.1	·· 55.8	105 25.7	12.5	9 18.3	9.0	56.0
22	148 27.1	55.3	119 57.2	12.6	9 09.3	9.0	56.1
23	163 27.0	54.9	134 28.8	12.5	9 00.3	9.1	56.1
19 00	178 27.0	N20 54.4	149 00.3	12.5	N 8 51.2	9.2	56.1
01	193 26.9	54.0	163 31.8	12.5	8 42.0	9.2	56.1
02	208 26.9	53.5	178 03.3	12.6	8 32.8	9.2	56.1
03	223 26.9	·· 53.1	192 34.9	12.5	8 23.6	9.3	56.2
04	238 26.8	52.6	207 06.4	12.5	8 14.3	9.3	56.2
05	253 26.8	52.2	221 37.9	12.6	8 05.0	9.4	56.2
06	268 26.7	N20 51.7	236 09.5	12.5	N 7 55.6	9.4	56.2
07	283 26.7	51.3	250 41.0	12.6	7 46.2	9.4	56.2
08	298 26.6	50.8	265 12.6	12.5	7 36.8	9.5	56.3
T 09	313 26.6	·· 50.4	279 44.1	12.6	7 27.3	9.6	56.3
U 10	328 26.6	49.9	294 15.7	12.5	7 17.7	9.6	56.3
E 11	343 26.5	49.5	308 47.2	12.6	7 08.1	9.6	56.3
S 12	358 26.5	N20 49.0	323 18.8	12.5	N 6 58.5	9.6	56.4
D 13	13 26.4	48.5	337 50.3	12.6	6 48.9	9.8	56.4
A 14	28 26.4	48.1	352 21.9	12.5	6 39.1	9.7	56.4
Y 15	43 26.3	·· 47.6	6 53.4	12.6	6 29.4	9.8	56.4
16	58 26.3	47.2	21 25.0	12.5	6 19.6	9.8	56.4
17	73 26.3	46.7	35 56.5	12.6	6 09.8	9.8	56.5
18	88 26.2	N20 46.3	50 28.1	12.5	N 6 00.0	9.9	56.5
19	103 26.2	45.8	64 59.6	12.5	5 50.1	9.9	56.5
20	118 26.1	45.3	79 31.1	12.6	5 40.2	10.0	56.5
21	133 26.1	·· 44.9	94 02.7	12.5	5 30.2	10.0	56.5
22	148 26.1	44.4	108 34.2	12.5	5 20.2	10.0	56.6
23	163 26.0	44.0	123 05.7	12.5	5 10.2	10.1	56.6
20 00	178 26.0	N20 43.5	137 37.2	12.5	N 5 00.1	10.1	56.6
01	193 25.9	43.0	152 08.7	12.5	4 50.0	10.1	56.6
02	208 25.9	42.6	166 40.2	12.5	4 39.9	10.1	56.7
03	223 25.9	·· 42.1	181 11.7	12.5	4 29.8	10.2	56.7
04	238 25.8	41.6	195 43.2	12.5	4 19.6	10.2	56.7
05	253 25.8	41.2	210 14.7	12.5	4 09.4	10.2	56.7
06	268 25.8	N20 40.7	224 46.2	12.5	N 3 59.2	10.3	56.7
W 07	283 25.7	40.2	239 17.7	12.4	3 48.9	10.2	56.8
E 08	298 25.7	39.8	253 49.1	12.5	3 38.7	10.4	56.8
09	313 25.6	·· 39.3	268 20.6	12.4	3 28.3	10.3	56.8
D 10	328 25.6	38.8	282 52.0	12.4	3 18.0	10.3	56.8
N 11	343 25.6	38.4	297 23.4	12.4	3 07.7	10.4	56.9
E 12	358 25.5	N20 37.9	311 54.8	12.4	N 2 57.3	10.4	56.9
S 13	13 25.5	37.4	326 26.2	12.4	2 46.9	10.4	56.9
D 14	28 25.5	36.9	340 57.6	12.4	2 36.5	10.5	56.9
A 15	43 25.4	·· 36.5	355 29.0	12.3	2 26.0	10.4	57.0
Y 16	58 25.4	36.0	10 00.3	12.3	2 15.6	10.5	57.0
17	73 25.4	35.5	24 31.6	12.4	2 05.1	10.5	57.0
18	88 25.3	N20 35.0	39 03.0	12.3	N 1 54.6	10.5	57.0
19	103 25.3	34.6	53 34.3	12.3	1 44.1	10.5	57.0
20	118 25.3	34.1	68 05.6	12.2	1 33.6	10.6	57.1
21	133 25.2	·· 33.6	82 36.8	12.3	1 23.0	10.5	57.1
22	148 25.2	33.1	97 08.1	12.2	1 12.5	10.6	57.1
23	163 25.1	32.7	111 39.3	12.2	1 01.9	10.6	57.1
	S.D. 15.8	*d* 0.5	S.D. 15.2		15.4		15.5

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 18	Moonrise 19	Moonrise 20	Moonrise 21
°	h m	h m	h m	h m	h m	h m	h m
N 72	□	□	□	04 53	06 38	08 23	10 08
N 70	□	□	□	05 13	06 50	08 28	10 07
68	////	////	00 43	05 29	07 00	08 32	10 05
66	////	////	01 52	05 42	07 08	08 35	10 04
64	////	////	02 27	05 52	07 14	08 38	10 03
62	////	01 14	02 52	06 01	07 20	08 40	10 03
60	////	01 57	03 11	06 09	07 25	08 43	10 02
N 58	////	02 25	03 27	06 16	07 29	08 44	10 01
56	01 08	02 46	03 41	06 22	07 33	08 46	10 01
54	01 47	03 03	03 52	06 27	07 36	08 48	10 01
52	02 13	03 18	04 03	06 32	07 40	08 49	10 00
50	02 33	03 30	04 12	06 36	07 42	08 50	10 00
45	03 10	03 56	04 31	06 46	07 49	08 53	09 59
N 40	03 36	04 15	04 47	06 53	07 54	08 55	09 58
35	03 56	04 31	05 00	07 00	07 58	08 57	09 58
30	04 12	04 44	05 11	07 06	08 02	08 59	09 57
20	04 38	05 06	05 30	07 16	08 09	09 02	09 56
N 10	04 58	05 25	05 47	07 25	08 15	09 05	09 56
0	05 15	05 41	06 03	07 33	08 20	09 07	09 55
S 10	05 30	05 56	06 18	07 41	08 26	09 10	09 54
20	05 44	06 11	06 34	07 50	08 32	09 13	09 54
30	05 58	06 27	06 53	08 00	08 38	09 16	09 53
35	06 05	06 36	07 04	08 06	08 42	09 17	09 52
40	06 13	06 46	07 16	08 13	08 47	09 19	09 52
45	06 21	06 58	07 30	08 20	08 52	09 22	09 51
S 50	06 31	07 11	07 48	08 29	08 58	09 24	09 51
52	06 35	07 17	07 56	08 34	09 00	09 26	09 51
54	06 40	07 24	08 06	08 38	09 03	09 27	09 50
56	06 45	07 32	08 16	08 43	09 07	09 29	09 50
58	06 50	07 40	08 28	08 49	09 10	09 30	09 50
S 60	06 56	07 50	08 42	08 55	09 15	09 32	09 49

Lat.	Sunset	Twilight Civil	Twilight Naut.	Moonset 18	Moonset 19	Moonset 20	Moonset 21
°	h m	h m	h m	h m	h m	h m	h m
N 72	□	□	□	21 57	21 51	21 45	21 39
N 70	□	□	□	21 44	21 44	21 43	21 43
68	23 18	////	////	21 33	21 38	21 42	21 46
66	22 17	////	////	21 24	21 33	21 41	21 49
64	21 43	////	////	21 16	21 29	21 40	21 52
62	21 19	22 53	////	21 09	21 25	21 39	21 54
60	21 00	22 13	////	21 03	21 22	21 39	21 56
N 58	20 44	21 45	////	20 58	21 19	21 38	21 57
56	20 31	21 25	23 00	20 54	21 16	21 37	21 59
54	20 19	21 08	22 23	20 49	21 14	21 37	22 00
52	20 09	20 53	21 57	20 46	21 12	21 36	22 01
50	20 00	20 41	21 38	20 42	21 10	21 36	22 03
45	19 41	20 16	21 02	20 35	21 05	21 35	22 05
N 40	19 25	19 57	20 36	20 29	21 02	21 34	22 07
35	19 12	19 41	20 16	20 23	20 59	21 34	22 09
30	19 01	19 28	20 00	20 18	20 56	21 33	22 11
20	18 42	19 06	19 34	20 10	20 51	21 32	22 13
N 10	18 25	18 48	19 14	20 03	20 47	21 31	22 16
0	18 10	18 32	18 58	19 56	20 43	21 30	22 18
S 10	17 55	18 17	18 43	19 49	20 39	21 29	22 20
20	17 38	18 02	18 29	19 41	20 34	21 28	22 23
30	17 20	17 46	18 15	19 33	20 29	21 27	22 25
35	17 09	17 37	18 08	19 28	20 26	21 26	22 27
40	16 57	17 27	18 00	19 22	20 23	21 25	22 29
45	16 42	17 15	17 51	19 16	20 19	21 24	22 31
S 50	16 25	17 02	17 42	19 08	20 15	21 23	22 33
52	16 17	16 55	17 38	19 04	20 13	21 23	22 34
54	16 07	16 49	17 33	19 00	20 10	21 22	22 36
56	15 57	16 41	17 28	18 55	20 08	21 21	22 37
58	15 45	16 33	17 23	18 50	20 05	21 21	22 38
S 60	15 31	16 23	17 17	18 45	20 01	21 20	22 40

Day	SUN Eqn. of Time 00ʰ	SUN Eqn. of Time 12ʰ	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
	m s	m s	h m	h m	h m	d	
18	06 07	06 10	12 06	13 44	01 21	02	
19	06 12	06 14	12 06	14 32	02 08	03	◑
20	06 16	06 18	12 06	15 19	02 55	04	

	G.M.T.	ARIES	VENUS −3.6		MARS +1.2		JUPITER −1.6		SATURN +0.6	
		G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
	d h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
	21 00	298 38.8	223 59.2	N20 17.5	238 15.5	N20 02.3	215 01.0	N22 52.8	158 25.9	N16 32.8
	01	313 41.2	238 58.7	17.9	253 16.1	02.7	230 02.9	52.8	173 28.1	32.7
	02	328 43.7	253 58.3	18.3	268 16.8	03.1	245 04.8	52.8	188 30.2	32.6
	03	343 46.2	268 57.8	·· 18.7	283 17.5	·· 03.5	260 06.7	·· 52.8	203 32.4	·· 32.5
	04	358 48.6	283 57.3	19.0	298 18.1	03.8	275 08.6	52.9	218 34.6	32.4
	05	13 51.1	298 56.9	19.4	313 18.8	04.2	290 10.5	52.9	233 36.7	32.4
	06	28 53.6	313 56.4	N20 19.8	328 19.5	N20 04.6	305 12.4	N22 52.9	248 38.9	N16 32.3
	07	43 56.0	328 55.9	20.2	343 20.1	04.9	320 14.3	52.9	263 41.0	32.2
T	08	58 58.5	343 55.5	20.6	358 20.8	05.3	335 16.2	53.0	278 43.2	32.1
H	09	74 00.9	358 55.0	·· 21.0	13 21.5	·· 05.7	350 18.1	·· 53.0	293 45.3	·· 32.0
U	10	89 03.4	13 54.6	21.4	28 22.1	06.0	5 20.0	53.0	308 47.5	31.9
R	11	104 05.9	28 54.1	21.7	43 22.8	06.4	20 21.9	53.0	323 49.7	31.8
S	12	119 08.3	43 53.6	N20 22.1	58 23.4	N20 06.8	35 23.8	N22 53.1	338 51.8	N16 31.7
D	13	134 10.8	58 53.2	22.5	73 24.1	07.1	50 25.6	53.1	353 54.0	31.6
A	14	149 13.3	73 52.7	22.9	88 24.8	07.5	65 27.5	53.1	8 56.1	31.5
Y	15	164 15.7	88 52.2	·· 23.3	103 25.4	·· 07.9	80 29.4	·· 53.1	23 58.3	·· 31.4
	16	179 18.2	103 51.8	23.6	118 26.1	08.2	95 31.3	53.2	39 00.4	31.3
	17	194 20.7	118 51.3	24.0	133 26.8	08.6	110 33.2	53.2	54 02.6	31.2
	18	209 23.1	133 50.8	N20 24.4	148 27.4	N20 09.0	125 35.1	N22 53.2	69 04.8	N16 31.1
	19	224 25.6	148 50.4	24.8	163 28.1	09.3	140 37.0	53.2	84 06.9	31.1
	20	239 28.1	163 49.9	25.2	178 28.8	09.7	155 38.9	53.3	99 09.1	31.0
	21	254 30.5	178 49.4	·· 25.5	193 29.4	·· 10.1	170 40.8	·· 53.3	114 11.2	·· 30.9
	22	269 33.0	193 49.0	25.9	208 30.1	10.4	185 42.7	53.3	129 13.4	30.8
	23	284 35.4	208 48.5	26.3	223 30.8	10.8	200 44.6	53.3	144 15.5	30.7
	22 00	299 37.9	223 48.0	N20 26.7	238 31.4	N20 11.2	215 46.5	N22 53.4	159 17.7	N16 30.6
	01	314 40.4	238 47.6	27.0	253 32.1	11.5	230 48.4	53.4	174 19.8	30.5
	02	329 42.8	253 47.1	27.4	268 32.8	11.9	245 50.3	53.4	189 22.0	30.4
	03	344 45.3	268 46.6	·· 27.8	283 33.4	·· 12.3	260 52.2	·· 53.4	204 24.2	·· 30.3
	04	359 47.8	283 46.1	28.1	298 34.1	12.6	275 54.1	53.5	219 26.3	30.2
	05	14 50.2	298 45.7	28.5	313 34.7	13.0	290 56.0	53.5	234 28.5	30.1
	06	29 52.7	313 45.2	N20 28.9	328 35.4	N20 13.3	305 57.9	N22 53.5	249 30.6	N16 30.0
	07	44 55.2	328 44.7	29.2	343 36.1	13.7	320 59.8	53.5	264 32.8	29.9
	08	59 57.6	343 44.2	29.6	358 36.7	14.1	336 01.7	53.6	279 34.9	29.8
F	09	75 00.1	358 43.8	·· 30.0	13 37.4	·· 14.4	351 03.6	·· 53.6	294 37.1	·· 29.8
R	10	90 02.6	13 43.3	30.3	28 38.1	14.8	6 05.5	53.6	309 39.3	29.7
I	11	105 05.0	28 42.8	30.7	43 38.7	15.1	21 07.4	53.6	324 41.4	29.6
D	12	120 07.5	43 42.3	N20 31.1	58 39.4	N20 15.5	36 09.3	N22 53.7	339 43.6	N16 29.5
A	13	135 09.9	58 41.9	31.4	73 40.1	15.9	51 11.2	53.7	354 45.7	29.4
Y	14	150 12.4	73 41.4	31.8	88 40.7	16.2	66 13.1	53.7	9 47.9	29.3
	15	165 14.9	88 40.9	·· 32.2	103 41.4	·· 16.6	81 15.0	·· 53.7	24 50.0	·· 29.2
	16	180 17.3	103 40.4	32.5	118 42.1	16.9	96 16.9	53.7	39 52.2	29.1
	17	195 19.8	118 40.0	32.9	133 42.7	17.3	111 18.8	53.8	54 54.3	29.0
	18	210 22.3	133 39.5	N20 33.2	148 43.4	N20 17.7	126 20.7	N22 53.8	69 56.5	N16 28.9
	19	225 24.7	148 39.0	33.6	163 44.1	18.0	141 22.6	53.8	84 58.7	28.8
	20	240 27.2	163 38.5	34.0	178 44.7	18.4	156 24.5	53.8	100 00.8	28.7
	21	255 29.7	178 38.0	·· 34.3	193 45.4	·· 18.7	171 26.4	·· 53.9	115 03.0	·· 28.6
	22	270 32.1	193 37.6	34.7	208 46.0	19.1	186 28.3	53.9	130 05.1	28.5
	23	285 34.6	208 37.1	35.0	223 46.7	19.4	201 30.2	53.9	145 07.3	28.5
	23 00	300 37.0	223 36.6	N20 35.4	238 47.4	N20 19.8	216 32.1	N22 53.9	160 09.4	N16 28.4
	01	315 39.5	238 36.1	35.7	253 48.0	20.1	231 34.0	54.0	175 11.6	28.3
	02	330 42.0	253 35.6	36.1	268 48.7	20.5	246 35.9	54.0	190 13.7	28.2
	03	345 44.4	268 35.1	·· 36.4	283 49.4	·· 20.9	261 37.8	·· 54.0	205 15.9	·· 28.1
	04	0 46.9	283 34.7	36.8	298 50.0	21.2	276 39.7	54.0	220 18.1	28.0
	05	15 49.4	298 34.2	37.1	313 50.7	21.6	291 41.6	54.1	235 20.2	27.9
	06	30 51.8	313 33.7	N20 37.5	328 51.4	N20 21.9	306 43.5	N22 54.1	250 22.4	N16 27.8
	07	45 54.3	328 33.2	37.8	343 52.0	22.3	321 45.4	54.1	265 24.5	27.7
S	08	60 56.8	343 32.7	38.2	358 52.7	22.6	336 47.3	54.1	280 26.7	27.6
A	09	75 59.2	358 32.2	·· 38.5	13 53.4	·· 23.0	351 49.2	·· 54.1	295 28.8	·· 27.5
T	10	91 01.7	13 31.7	38.9	28 54.0	23.3	6 51.1	54.2	310 31.0	27.4
U	11	106 04.2	28 31.2	39.2	43 54.7	23.7	21 53.0	54.2	325 33.1	27.3
R	12	121 06.6	43 30.8	N20 39.6	58 55.4	N20 24.0	36 54.9	N22 54.2	340 35.3	N16 27.2
D	13	136 09.1	58 30.3	39.9	73 56.0	24.4	51 56.8	54.2	355 37.5	27.1
A	14	151 11.5	73 29.8	40.3	88 56.7	24.7	66 58.7	54.3	10 39.6	27.1
Y	15	166 14.0	88 29.3	·· 40.6	103 57.4	·· 25.1	82 00.6	·· 54.3	25 41.8	·· 27.0
	16	181 16.5	103 28.8	40.9	118 58.0	25.4	97 02.5	54.3	40 43.9	26.9
	17	196 18.9	118 28.3	41.3	133 58.7	25.8	112 04.4	54.3	55 46.1	26.8
	18	211 21.4	133 27.8	N20 41.6	148 59.4	N20 26.1	127 06.3	N22 54.4	70 48.2	N16 26.7
	19	226 23.9	148 27.3	42.0	164 00.0	26.5	142 08.2	54.4	85 50.4	26.6
	20	241 26.3	163 26.8	42.3	179 00.7	26.8	157 10.1	54.4	100 52.5	26.5
	21	256 28.8	178 26.3	·· 42.6	194 01.4	·· 27.2	172 12.0	·· 54.4	115 54.7	·· 26.4
	22	271 31.3	193 25.8	43.0	209 02.0	27.5	187 13.9	54.4	130 56.9	26.3
	23	286 33.7	208 25.4	43.3	224 02.7	27.9	202 15.8	54.5	145 59.0	26.2
	Mer. Pass.	h m 4 00.8	v −0.5	d 0.4	v 0.7	d 0.4	v 1.9	d 0.0	v 2.2	d 0.1

STARS

Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 39.0	S40 23.5
Achernar	335 46.9	S57 20.7
Acrux	173 39.7	S62 58.8
Adhara	255 34.1	S28 56.5
Aldebaran	291 20.6	N16 27.8
Alioth	166 44.6	N56 05.2
Alkaid	153 20.2	N49 25.8
Al Na'ir	28 17.2	S47 03.9
Alnilam	276 14.1	S 1 13.0
Alphard	218 22.9	S 8 33.7
Alphecca	126 33.8	N26 47.7
Alpheratz	358 11.3	N28 57.9
Altair	62 34.2	N 8 48.7
Ankaa	353 42.2	S42 25.4
Antares	112 59.2	S26 22.9
Arcturus	146 20.4	N19 18.1
Atria	108 24.9	S68 59.4
Avior	234 29.6	S59 26.4
Bellatrix	279 01.3	N 6 19.7
Betelgeuse	271 30.9	N 7 24.1
Canopus	264 08.6	S52 41.0
Capella	281 14.8	N45 58.4
Deneb	49 49.4	N45 12.1
Denebola	183 01.4	N14 41.9
Diphda	349 22.9	S18 06.4
Dubhe	194 25.3	N61 52.5
Elnath	278 47.1	N28 35.2
Eltanin	90 58.2	N51 29.8
Enif	34 13.3	N 9 46.5
Fomalhaut	15 53.5	S29 44.2
Gacrux	172 31.2	S56 59.5
Gienah	176 20.3	S17 25.1
Hadar	149 26.2	S60 16.1
Hamal	328 31.3	N23 21.3
Kaus Aust.	84 19.3	S34 23.7
Kochab	137 18.8	N74 15.2
Markab	14 05.0	N15 05.1
Menkar	314 43.4	N 4 00.1
Menkent	148 39.4	S36 15.7
Miaplacidus	221 46.2	S69 37.7
Mirfak	309 19.3	N49 46.7
Nunki	76 31.4	S26 19.4
Peacock	54 01.2	S56 48.3
Pollux	244 01.1	N28 04.8
Procyon	245 28.3	N 5 16.9
Rasalhague	96 31.3	N12 34.8
Regulus	208 12.5	N12 04.6
Rigel	281 38.3	S 8 13.6
Rigil Kent.	140 28.4	S60 44.7
Sabik	102 43.3	S15 41.8
Schedar	350 11.1	N56 24.7
Shaula	96 58.3	S37 05.2
Sirius	258 57.9	S16 41.2
Spica	158 59.8	S11 02.7
Suhail	223 12.7	S43 20.6
Vega	80 56.8	N38 46.0
Zuben'ubi	137 35.3	S15 56.9

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	284 10.1	9 05
Mars	298 53.5	8 06
Jupiter	276 08.6	9 36
Saturn	219 39.8	13 21

	G.M.T.	SUN G.H.A.	SUN Dec.	MOON G.H.A.	MOON v	MOON Dec.	MOON d	MOON H.P.
	d h	° ′	° ′	° ′	′	° ′	′	′
	21 00	178 25.1	N20 32.2	126 10.5	12.2	N 0 51.3	10.6	57.2
	01	193 25.1	31.7	140 41.7	12.2	0 40.7	10.6	57.2
	02	208 25.1	31.2	155 12.9	12.1	0 30.1	10.6	57.2
	03	223 25.0	·· 30.8	169 44.0	12.2	0 19.5	10.6	57.2
	04	238 25.0	30.3	184 15.2	12.1	N 0 08.9	10.6	57.3
	05	253 25.0	29.8	198 46.3	12.0	S 0 01.7	10.7	57.3
	06	268 24.9	N20 29.3	213 17.3	12.1	S 0 12.4	10.6	57.3
	07	283 24.9	28.8	227 48.4	12.0	0 23.0	10.7	57.3
T	08	298 24.9	28.4	242 19.4	12.0	0 33.7	10.6	57.3
H	09	313 24.8	·· 27.9	256 50.4	12.0	0 44.3	10.7	57.4
U	10	328 24.8	27.4	271 21.4	11.9	0 55.0	10.7	57.4
R	11	343 24.8	26.9	285 52.3	12.0	1 05.7	10.6	57.4
S	12	358 24.7	N20 26.4	300 23.3	11.9	S 1 16.3	10.7	57.4
D	13	13 24.7	25.9	314 54.2	11.8	1 27.0	10.7	57.5
A	14	28 24.7	25.4	329 25.0	11.9	1 37.7	10.6	57.5
Y	15	43 24.6	·· 25.0	343 55.9	11.8	1 48.3	10.7	57.5
	16	58 24.6	24.5	358 26.7	11.7	1 59.0	10.7	57.5
	17	73 24.6	24.0	12 57.4	11.8	2 09.7	10.6	57.6
	18	88 24.6	N20 23.5	27 28.2	11.7	S 2 20.3	10.7	57.6
	19	103 24.5	23.0	41 58.9	11.7	2 31.0	10.7	57.6
	20	118 24.5	22.5	56 29.6	11.6	2 41.7	10.6	57.6
	21	133 24.5	·· 22.0	71 00.2	11.6	2 52.3	10.7	57.7
	22	148 24.5	21.5	85 30.8	11.6	3 03.0	10.6	57.7
	23	163 24.4	21.0	100 01.4	11.5	3 13.6	10.6	57.7
	22 00	178 24.4	N20 20.6	114 31.9	11.5	S 3 24.2	10.6	57.7
	01	193 24.4	20.1	129 02.4	11.4	3 34.8	10.6	57.8
	02	208 24.3	19.6	143 32.8	11.5	3 45.4	10.6	57.8
	03	223 24.3	·· 19.1	158 03.3	11.3	3 56.0	10.6	57.8
	04	238 24.3	18.6	172 33.6	11.4	4 06.6	10.6	57.8
	05	253 24.3	18.1	187 04.0	11.3	4 17.2	10.5	57.9
	06	268 24.2	N20 17.6	201 34.3	11.2	S 4 27.7	10.6	57.9
	07	283 24.2	17.1	216 04.5	11.3	4 38.3	10.5	57.9
	08	298 24.2	16.6	230 34.8	11.1	4 48.8	10.5	57.9
F	09	313 24.2	·· 16.1	245 04.9	11.2	4 59.3	10.5	58.0
R	10	328 24.1	15.6	259 35.1	11.1	5 09.8	10.5	58.0
I	11	343 24.1	15.1	274 05.2	11.0	5 20.3	10.4	58.0
D	12	358 24.1	N20 14.6	288 35.2	11.0	S 5 30.7	10.5	58.0
A	13	13 24.1	14.1	303 05.2	11.0	5 41.2	10.4	58.0
Y	14	28 24.0	13.6	317 35.2	10.9	5 51.6	10.4	58.1
	15	43 24.0	·· 13.1	332 05.1	10.8	6 02.0	10.3	58.1
	16	58 24.0	12.6	346 34.9	10.8	6 12.3	10.4	58.1
	17	73 24.0	12.1	1 04.7	10.8	6 22.7	10.3	58.1
	18	88 24.0	N20 11.6	15 34.5	10.7	S 6 33.0	10.2	58.2
	19	103 23.9	11.1	30 04.2	10.7	6 43.2	10.3	58.2
	20	118 23.9	10.6	44 33.9	10.6	6 53.5	10.2	58.2
	21	133 23.9	·· 10.1	59 03.5	10.6	7 03.7	10.2	58.2
	22	148 23.9	09.6	73 33.1	10.5	7 13.9	10.2	58.3
	23	163 23.8	09.1	88 02.6	10.4	7 24.1	10.1	58.3
	23 00	178 23.8	N20 08.6	102 32.0	10.4	S 7 34.2	10.1	58.3
	01	193 23.8	08.1	117 01.4	10.4	7 44.3	10.1	58.3
	02	208 23.8	07.6	131 30.8	10.3	7 54.4	10.0	58.4
	03	223 23.8	·· 07.1	146 00.1	10.2	8 04.4	10.0	58.4
	04	238 23.7	06.5	160 29.3	10.2	8 14.4	10.0	58.4
	05	253 23.7	06.0	174 58.5	10.2	8 24.4	9.9	58.4
	06	268 23.7	N20 05.5	189 27.7	10.1	S 8 34.3	9.8	58.5
	07	283 23.7	05.0	203 56.8	10.0	8 44.1	9.9	58.5
S	08	298 23.7	04.5	218 25.8	9.9	8 54.0	9.8	58.5
A	09	313 23.7	·· 04.0	232 54.7	9.9	9 03.8	9.7	58.5
T	10	328 23.6	03.5	247 23.6	9.9	9 13.5	9.7	58.6
U	11	343 23.6	03.0	261 52.5	9.8	9 23.2	9.7	58.6
R	12	358 23.6	N20 02.5	276 21.3	9.7	S 9 32.9	9.6	58.6
D	13	13 23.6	01.9	290 50.0	9.7	9 42.5	9.6	58.6
A	14	28 23.6	01.4	305 18.7	9.6	9 52.1	9.5	58.7
Y	15	43 23.5	·· 00.9	319 47.3	9.6	10 01.6	9.5	58.7
	16	58 23.5	20 00.4	334 15.9	9.4	10 11.1	9.4	58.7
	17	73 23.5	19 59.9	348 44.3	9.5	10 20.5	9.4	58.7
	18	88 23.5	N19 59.4	3 12.8	9.3	S10 29.9	9.3	58.8
	19	103 23.5	58.9	17 41.1	9.3	10 39.2	9.2	58.8
	20	118 23.5	58.3	32 09.4	9.3	10 48.4	9.2	58.8
	21	133 23.5	·· 57.8	46 37.7	9.2	10 57.6	9.2	58.8
	22	148 23.4	57.3	61 05.9	9.1	11 06.8	9.1	58.8
	23	163 23.4	56.8	75 34.0	9.0	11 15.9	9.0	58.9
		S.D. 15.8	d 0.5	S.D. 15.7		15.8		16.0

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 21	Moonrise 22	Moonrise 23	Moonrise 24
°	h m	h m	h m	h m	h m	h m	h m
N 72	▭	▭	▭	10 08	11 56	13 50	15 51
N 70	▭	▭	▭	10 07	11 48	13 33	15 22
68	////	////	01 13	10 05	11 41	13 20	15 01
66	////	////	02 04	10 04	11 36	13 09	14 44
64	////	////	02 36	10 03	11 31	13 00	14 31
62	////	01 30	02 59	10 03	11 27	12 53	14 19
60	////	02 07	03 17	10 02	11 23	12 46	14 10
N 58	////	02 33	03 33	10 01	11 20	12 40	14 01
56	01 22	02 53	03 46	10 01	11 17	12 35	13 54
54	01 56	03 09	03 57	10 01	11 15	12 31	13 47
52	02 20	03 23	04 07	10 00	11 13	12 27	13 41
50	02 39	03 35	04 16	10 00	11 11	12 23	13 36
45	03 14	03 59	04 34	09 59	11 06	12 15	13 25
N 40	03 39	04 18	04 49	09 58	11 02	12 08	13 15
35	03 58	04 33	05 02	09 58	10 59	12 02	13 07
30	04 14	04 46	05 13	09 57	10 57	11 57	13 00
20	04 39	05 08	05 32	09 56	10 52	11 49	12 48
N 10	04 59	05 25	05 48	09 56	10 48	11 41	12 37
0	05 15	05 41	06 03	09 55	10 44	11 34	12 27
S 10	05 30	05 55	06 18	09 54	10 40	11 27	12 18
20	05 43	06 10	06 34	09 54	10 36	11 20	12 07
30	05 57	06 26	06 51	09 53	10 31	11 12	11 55
35	06 04	06 35	07 02	09 52	10 29	11 07	11 49
40	06 11	06 44	07 14	09 52	10 26	11 01	11 41
45	06 19	06 55	07 28	09 51	10 22	10 55	11 32
S 50	06 28	07 08	07 45	09 51	10 18	10 48	11 21
52	06 32	07 14	07 53	09 51	10 16	10 44	11 16
54	06 37	07 21	08 02	09 50	10 14	10 41	11 11
56	06 41	07 28	08 12	09 50	10 12	10 36	11 05
58	06 46	07 36	08 23	09 50	10 10	10 32	10 58
S 60	06 52	07 45	08 36	09 49	10 07	10 27	10 50

Lat.	Sunset	Twilight Civil	Twilight Naut.	Moonset 21	Moonset 22	Moonset 23	Moonset 24
°	h m	h m	h m	h m	h m	h m	h m
N 72	▭	▭	▭	21 39	21 32	21 25	21 15
N 70	▭	▭	▭	21 43	21 42	21 43	21 45
68	22 53	////	////	21 46	21 51	21 57	22 07
66	22 05	////	////	21 49	21 58	22 09	22 25
64	21 34	////	////	21 52	22 04	22 19	22 39
62	21 12	22 39	////	21 54	22 09	22 28	22 51
60	20 54	22 03	////	21 56	22 14	22 35	23 02
N 58	20 39	21 38	////	21 57	22 18	22 42	23 11
56	20 26	21 19	22 47	21 59	22 22	22 48	23 19
54	20 15	21 03	22 14	22 00	22 25	22 53	23 26
52	20 05	20 49	21 51	22 01	22 28	22 58	23 32
50	19 56	20 37	21 32	22 03	22 31	23 02	23 38
45	19 38	20 13	20 58	22 05	22 37	23 11	23 50
N 40	19 23	19 54	20 33	22 07	22 42	23 19	24 01
35	19 11	19 39	20 14	22 09	22 46	23 26	24 10
30	19 00	19 26	19 58	22 11	22 50	23 32	24 17
20	18 41	19 05	19 33	22 13	22 56	23 42	24 31
N 10	18 25	18 47	19 14	22 16	23 02	23 51	24 43
0	18 10	18 32	18 58	22 18	23 08	23 59	24 54
S 10	17 55	18 17	18 43	22 20	23 13	24 08	00 08
20	17 39	18 03	18 30	22 23	23 19	24 17	00 17
30	17 22	17 47	18 16	22 25	23 25	24 27	00 27
35	17 11	17 38	18 09	22 27	23 29	24 33	00 33
40	16 59	17 29	18 02	22 29	23 34	24 40	00 40
45	16 45	17 18	17 54	22 31	23 39	24 48	00 48
S 50	16 28	17 05	17 45	22 33	23 45	24 57	00 57
52	16 20	16 59	17 41	22 34	23 47	25 02	01 02
54	16 12	16 52	17 37	22 36	23 51	25 07	01 07
56	16 02	16 45	17 32	22 37	23 54	25 12	01 12
58	15 50	16 37	17 27	22 38	23 58	25 18	01 18
S 60	15 37	16 28	17 22	22 40	24 02	00 02	01 25

Day	SUN Eqn. of Time 00ʰ	SUN Eqn. of Time 12ʰ	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
	m s	m s	h m	h m	h m	d	
21	06 19	06 21	12 06	16 06	03 42	05	
22	06 22	06 24	12 06	16 56	04 31	06	☽
23	06 25	06 26	12 06	17 47	05 21	07	

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1977 JULY 24, 25, 26 (SUN., MON., TUES.)

G.M.T.		ARIES	VENUS −3.6		MARS +1.2		JUPITER −1.6		SATURN +0.6	
		G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
d h		° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
24 00		301 36.2	223 24.9	N20 43.6	239 03.3	N20 28.2	217 17.7	N22 54.5	161 01.2	N16 26.1
01		316 38.7	238 24.4	44.0	254 04.0	28.6	232 19.6	54.5	176 03.3	26.0
02		331 41.1	253 23.9	44.3	269 04.7	28.9	247 21.5	54.5	191 05.5	25.9
03		346 43.6	268 23.4	·· 44.7	284 05.3	·· 29.3	262 23.4	·· 54.6	206 07.6	·· 25.8
04		1 46.0	283 22.9	45.0	299 06.0	29.6	277 25.3	54.6	221 09.8	25.7
05		16 48.5	298 22.4	45.3	314 06.7	30.0	292 27.2	54.6	236 11.9	25.6
06		31 51.0	313 21.9	N20 45.6	329 07.3	N20 30.3	307 29.1	N22 54.6	251 14.1	N16 25.6
07		46 53.4	328 21.4	46.0	344 08.0	30.7	322 31.0	54.6	266 16.2	25.5
08		61 55.9	343 20.9	46.3	359 08.7	31.0	337 32.9	54.7	281 18.4	25.4
09	S	76 58.4	358 20.4	·· 46.6	14 09.3	·· 31.3	352 34.8	·· 54.7	296 20.6	·· 25.3
10	U	92 00.8	13 19.9	47.0	29 10.0	31.7	7 36.7	54.7	311 22.7	25.2
11	N	107 03.3	28 19.4	47.3	44 10.7	32.0	22 38.6	54.7	326 24.9	25.1
12	D	122 05.8	43 18.9	N20 47.6	59 11.3	N20 32.4	37 40.5	N22 54.8	341 27.0	N16 25.0
13	A	137 08.2	58 18.4	47.9	74 12.0	32.7	52 42.4	54.8	356 29.2	24.9
14	Y	152 10.7	73 17.9	48.3	89 12.7	33.1	67 44.3	54.8	11 31.3	24.8
15		167 13.1	88 17.4	·· 48.6	104 13.3	·· 33.4	82 46.2	·· 54.8	26 33.5	·· 24.7
16		182 15.6	103 16.9	48.9	119 14.0	33.7	97 48.1	54.8	41 35.6	24.6
17		197 18.1	118 16.4	49.2	134 14.7	34.1	112 50.0	54.9	56 37.8	24.5
18		212 20.5	133 15.9	N20 49.5	149 15.3	N20 34.4	127 51.9	N22 54.9	71 39.9	N16 24.4
19		227 23.0	148 15.4	49.9	164 16.0	34.8	142 53.8	54.9	86 42.1	24.3
20		242 25.5	163 14.9	50.2	179 16.7	35.1	157 55.7	54.9	101 44.3	24.2
21		257 27.9	178 14.4	·· 50.5	194 17.3	·· 35.5	172 57.6	·· 55.0	116 46.4	·· 24.1
22		272 30.4	193 13.9	50.8	209 18.0	35.8	187 59.5	55.0	131 48.6	24.1
23		287 32.9	208 13.3	51.1	224 18.7	36.1	203 01.4	55.0	146 50.7	24.0
25 00		302 35.3	223 12.8	N20 51.5	239 19.3	N20 36.5	218 03.3	N22 55.0	161 52.9	N16 23.9
01		317 37.8	238 12.3	51.8	254 20.0	36.8	233 05.2	55.0	176 55.0	23.8
02		332 40.3	253 11.8	52.1	269 20.7	37.2	248 07.2	55.1	191 57.2	23.7
03		347 42.7	268 11.3	·· 52.4	284 21.3	·· 37.5	263 09.1	·· 55.1	206 59.3	·· 23.6
04		2 45.2	283 10.8	52.7	299 22.0	37.8	278 11.0	55.1	222 01.5	23.5
05		17 47.6	298 10.3	53.0	314 22.7	38.2	293 12.9	55.1	237 03.6	23.4
06		32 50.1	313 09.8	N20 53.3	329 23.3	N20 38.5	308 14.8	N22 55.2	252 05.8	N16 23.3
07		47 52.6	328 09.3	53.6	344 24.0	38.8	323 16.7	55.2	267 07.9	23.2
08		62 55.0	343 08.8	54.0	359 24.7	39.2	338 18.6	55.2	282 10.1	23.1
09	M	77 57.5	358 08.3	·· 54.3	14 25.3	·· 39.5	353 20.5	·· 55.2	297 12.3	·· 23.0
10	O	93 00.0	13 07.8	54.6	29 26.0	39.9	8 22.4	55.2	312 14.4	22.9
11	N	108 02.4	28 07.2	54.9	44 26.7	40.2	23 24.3	55.3	327 16.6	22.8
12	D	123 04.9	43 06.7	N20 55.2	59 27.3	N20 40.5	38 26.2	N22 55.3	342 18.7	N16 22.7
13	A	138 07.4	58 06.2	55.5	74 28.0	40.9	53 28.1	55.3	357 20.9	22.6
14	Y	153 09.8	73 05.7	55.8	89 28.7	41.2	68 30.0	55.3	12 23.0	22.5
15		168 12.3	88 05.2	·· 56.1	104 29.3	·· 41.5	83 31.9	·· 55.3	27 25.2	·· 22.4
16		183 14.8	103 04.7	56.4	119 30.0	41.9	98 33.8	55.4	42 27.3	22.4
17		198 17.2	118 04.2	56.7	134 30.7	42.2	113 35.7	55.4	57 29.5	22.3
18		213 19.7	133 03.6	N20 57.0	149 31.3	N20 42.5	128 37.6	N22 55.4	72 31.6	N16 22.2
19		228 22.1	148 03.1	57.3	164 32.0	42.9	143 39.6	55.4	87 33.8	22.1
20		243 24.6	163 02.6	57.6	179 32.7	43.2	158 41.5	55.4	102 35.9	22.0
21		258 27.1	178 02.1	·· 57.9	194 33.3	·· 43.5	173 43.4	·· 55.5	117 38.1	·· 21.9
22		273 29.5	193 01.6	58.2	209 34.0	43.9	188 45.3	55.5	132 40.3	21.8
23		288 32.0	208 01.1	58.5	224 34.7	44.2	203 47.2	55.5	147 42.4	21.7
26 00		303 34.5	223 00.5	N20 58.8	239 35.3	N20 44.5	218 49.1	N22 55.5	162 44.6	N16 21.6
01		318 36.9	238 00.0	59.1	254 36.0	44.9	233 51.0	55.6	177 46.7	21.5
02		333 39.4	252 59.5	59.4	269 36.7	45.2	248 52.9	55.6	192 48.9	21.4
03		348 41.9	267 59.0	20 59.7	284 37.3	·· 45.5	263 54.8	·· 55.6	207 51.0	·· 21.3
04		3 44.3	282 58.5	21 00.0	299 38.0	45.8	278 56.7	55.6	222 53.2	21.2
05		18 46.8	297 58.0	00.3	314 38.7	46.2	293 58.6	55.6	237 55.3	21.1
06		33 49.2	312 57.4	N21 00.6	329 39.3	N20 46.5	309 00.5	N22 55.7	252 57.5	N16 21.0
07		48 51.7	327 56.9	00.8	344 40.0	46.8	324 02.4	55.7	267 59.6	20.9
08	T	63 54.2	342 56.4	01.1	359 40.7	47.2	339 04.4	55.7	283 01.8	20.8
09	U	78 56.6	357 55.9	·· 01.4	14 41.3	·· 47.5	354 06.3	·· 55.7	298 03.9	·· 20.8
10	E	93 59.1	12 55.3	01.7	29 42.0	47.8	9 08.2	55.7	313 06.1	20.7
11	S	109 01.6	27 54.8	02.0	44 42.7	48.2	24 10.1	55.8	328 08.2	20.6
12	D	124 04.0	42 54.3	N21 02.3	59 43.3	N20 48.5	39 12.0	N22 55.8	343 10.4	N16 20.5
13	A	139 06.5	57 53.8	02.6	74 44.0	48.8	54 13.9	55.8	358 12.5	20.4
14	Y	154 09.0	72 53.3	02.9	89 44.7	49.1	69 15.8	55.8	13 14.7	20.3
15		169 11.4	87 52.7	·· 03.1	104 45.3	·· 49.5	84 17.7	·· 55.8	28 16.9	·· 20.2
16		184 13.9	102 52.2	03.4	119 46.0	49.8	99 19.6	55.9	43 19.0	20.1
17		199 16.4	117 51.7	03.7	134 46.7	50.1	114 21.5	55.9	58 21.2	20.0
18		214 18.8	132 51.2	N21 04.0	149 47.3	N20 50.4	129 23.4	N22 55.9	73 23.3	N16 19.9
19		229 21.3	147 50.6	04.3	164 48.0	50.8	144 25.3	55.9	88 25.5	19.8
20		244 23.7	162 50.1	04.5	179 48.7	51.1	159 27.3	55.9	103 27.6	19.7
21		259 26.2	177 49.6	·· 04.8	194 49.3	·· 51.4	174 29.2	·· 56.0	118 29.8	·· 19.6
22		274 28.7	192 49.0	05.1	209 50.0	51.7	189 31.1	56.0	133 31.9	19.5
23		289 31.1	207 48.5	05.4	224 50.7	52.1	204 33.0	56.0	148 34.1	19.4
Mer. Pass.		h m 3 49.0	v −0.5	d 0.3	v 0.7	d 0.3	v 1.9	d 0.0	v 2.2	d 0.1

STARS		
Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 39.0	S40 23.5
Achernar	335 46.9	S57 20.7
Acrux	173 39.7	S62 58.8
Adhara	255 34.1	S28 56.5
Aldebaran	291 20.6	N16 27.8
Alioth	166 44.6	N56 05.2
Alkaid	153 20.3	N49 25.8
Al Na'ir	28 17.2	S47 03.9
Alnilam	276 14.1	S 1 13.0
Alphard	218 22.9	S 8 33.7
Alphecca	126 33.8	N26 47.7
Alpheratz	358 11.3	N28 58.0
Altair	62 34.2	N 8 48.7
Ankaa	353 42.2	S42 25.4
Antares	112 59.2	S26 22.9
Arcturus	146 20.4	N19 18.1
Atria	108 24.9	S68 59.4
Avior	234 29.6	S59 26.4
Bellatrix	279 01.3	N 6 19.7
Betelgeuse	271 30.8	N 7 24.1
Canopus	264 08.6	S52 41.0
Capella	281 14.8	N45 58.4
Deneb	49 49.4	N45 12.1
Denebola	183 01.4	N14 41.9
Diphda	349 22.9	S18 06.4
Dubhe	194 25.3	N61 52.5
Elnath	278 47.1	N28 35.2
Eltanin	90 58.3	N51 29.8
Enif	34 13.3	N 9 46.5
Fomalhaut	15 53.5	S29 44.2
Gacrux	172 31.2	S56 59.5
Gienah	176 20.3	S17 25.1
Hadar	149 26.2	S60 16.1
Hamal	328 31.3	N23 21.3
Kaus Aust.	84 19.3	S34 23.7
Kochab	137 18.8	N74 15.2
Markab	14 05.0	N15 05.1
Menkar	314 43.4	N 4 00.1
Menkent	148 39.4	S36 15.7
Miaplacidus	221 46.2	S69 37.7
Mirfak	309 19.2	N49 46.7
Nunki	76 31.4	S26 19.4
Peacock	54 01.2	S56 48.3
Pollux	244 01.1	N28 04.8
Procyon	245 28.3	N 5 16.9
Rasalhague	96 31.3	N12 34.8
Regulus	208 12.5	N12 04.6
Rigel	281 38.3	S 8 13.6
Rigil Kent.	140 28.5	S60 44.7
Sabik	102 43.3	S15 41.8
Schedar	350 11.1	N56 24.7
Shaula	96 58.3	S37 05.2
Sirius	258 57.9	S16 41.2
Spica	158 59.8	S11 02.7
Suhail	223 12.7	S43 20.6
Vega	80 56.9	N38 46.0
Zuben'ubi	137 35.3	S15 56.9

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	280 37.5	9 07
Mars	296 44.0	8 02
Jupiter	275 28.0	9 27
Saturn	219 17.5	13 11

	G.M.T.	SUN G.H.A.	SUN Dec.	MOON G.H.A.	MOON v	MOON Dec.	MOON d	MOON H.P.
	d h	° ′	° ′	° ′	′	° ′	′	′
	24 00	178 23.4	N19 56.3	90 02.0	9.0	S11 24.9	9.0	58.9
	01	193 23.4	55.7	104 30.0	8.9	11 33.9	8.9	58.9
	02	208 23.4	55.2	118 57.9	8.9	11 42.8	8.9	58.9
	03	223 23.4	· · 54.7	133 25.8	8.8	11 51.7	8.7	59.0
	04	238 23.4	54.2	147 53.6	8.7	12 00.4	8.8	59.0
	05	253 23.3	53.7	162 21.3	8.7	12 09.2	8.6	59.0
	06	268 23.3	N19 53.1	176 49.0	8.6	S12 17.8	8.6	59.0
	07	283 23.3	52.6	191 16.6	8.5	12 26.4	8.5	59.1
	08	298 23.3	52.1	205 44.1	8.5	12 34.9	8.5	59.1
S	09	313 23.3	· · 51.6	220 11.6	8.4	12 43.4	8.4	59.1
U	10	328 23.3	51.0	234 39.0	8.3	12 51.8	8.3	59.1
N	11	343 23.3	50.5	249 06.3	8.3	13 00.1	8.2	59.2
D	12	358 23.3	N19 50.0	263 33.6	8.2	S13 08.3	8.2	59.2
A	13	13 23.2	49.4	278 00.8	8.1	13 16.5	8.1	59.2
Y	14	28 23.2	48.9	292 27.9	8.1	13 24.6	8.0	59.2
	15	43 23.2	· · 48.4	306 55.0	7.9	13 32.6	8.0	59.2
	16	58 23.2	47.9	321 21.9	8.0	13 40.6	7.8	59.3
	17	73 23.2	47.3	335 48.9	7.8	13 48.4	7.8	59.3
	18	88 23.2	N19 46.8	350 15.7	7.8	S13 56.2	7.7	59.3
	19	103 23.2	46.3	4 42.5	7.8	14 03.9	7.6	59.3
	20	118 23.2	45.7	19 09.3	7.6	14 11.5	7.6	59.3
	21	133 23.2	· · 45.2	33 35.9	7.6	14 19.1	7.4	59.4
	22	148 23.2	44.7	48 02.5	7.5	14 26.5	7.4	59.4
	23	163 23.1	44.1	62 29.0	7.5	14 33.9	7.3	59.4
	25 00	178 23.1	N19 43.6	76 55.5	7.4	S14 41.2	7.2	59.4
	01	193 23.1	43.1	91 21.9	7.3	14 48.4	7.1	59.5
	02	208 23.1	42.5	105 48.2	7.3	14 55.5	7.0	59.5
	03	223 23.1	· · 42.0	120 14.5	7.2	15 02.5	6.9	59.5
	04	238 23.1	41.5	134 40.7	7.1	15 09.4	6.9	59.5
	05	253 23.1	40.9	149 06.8	7.1	15 16.3	6.7	59.5
	06	268 23.1	N19 40.4	163 32.9	7.0	S15 23.0	6.7	59.6
	07	283 23.1	39.9	177 58.9	6.9	15 29.7	6.5	59.6
	08	298 23.1	39.3	192 24.8	6.9	15 36.2	6.5	59.6
M	09	313 23.1	· · 38.8	206 50.7	6.8	15 42.7	6.3	59.6
O	10	328 23.1	38.2	221 16.5	6.7	15 49.0	6.3	59.6
N	11	343 23.1	37.7	235 42.2	6.7	15 55.3	6.2	59.7
D	12	358 23.1	N19 37.2	250 07.9	6.6	S16 01.5	6.0	59.7
A	13	13 23.1	36.6	264 33.5	6.6	16 07.5	6.0	59.7
Y	14	28 23.1	36.1	278 59.1	6.5	16 13.5	5.9	59.7
	15	43 23.0	· · 35.5	293 24.6	6.4	16 19.4	5.7	59.7
	16	58 23.0	35.0	307 50.0	6.4	16 25.1	5.7	59.7
	17	73 23.0	34.5	322 15.4	6.3	16 30.8	5.5	59.8
	18	88 23.0	N19 33.9	336 40.7	6.3	S16 36.3	5.5	59.8
	19	103 23.0	33.4	351 06.0	6.2	16 41.8	5.3	59.8
	20	118 23.0	32.8	5 31.2	6.1	16 47.1	5.2	59.8
	21	133 23.0	· · 32.3	19 56.3	6.1	16 52.3	5.1	59.8
	22	148 23.0	31.7	34 21.4	6.0	16 57.4	5.0	59.9
	23	163 23.0	31.2	48 46.4	6.0	17 02.4	4.9	59.9
	26 00	178 23.0	N19 30.6	63 11.4	5.9	S17 07.3	4.8	59.9
	01	193 23.0	30.1	77 36.3	5.8	17 12.1	4.7	59.9
	02	208 23.0	29.5	92 01.1	5.8	17 16.8	4.6	59.9
	03	223 23.0	· · 29.0	106 25.9	5.8	17 21.4	4.4	59.9
	04	238 23.0	28.4	120 50.7	5.7	17 25.8	4.3	59.9
	05	253 23.0	27.9	135 15.4	5.6	17 30.1	4.2	60.0
	06	268 23.0	N19 27.3	149 40.0	5.6	S17 34.3	4.1	60.0
	07	283 23.0	26.8	164 04.6	5.6	17 38.4	4.0	60.0
	08	298 23.0	26.2	178 29.2	5.5	17 42.4	3.9	60.0
T	09	313 23.0	· · 25.7	192 53.7	5.4	17 46.3	3.7	60.0
U	10	328 23.0	25.1	207 18.1	5.4	17 50.0	3.6	60.0
E	11	343 23.0	24.6	221 42.5	5.4	17 53.6	3.5	60.0
S	12	358 23.0	N19 24.0	236 06.9	5.3	S17 57.1	3.4	60.1
D	13	13 23.0	23.5	250 31.2	5.3	18 00.5	3.2	60.1
A	14	28 23.0	22.9	264 55.5	5.2	18 03.7	3.1	60.1
Y	15	43 23.0	· · 22.4	279 19.7	5.2	18 06.8	3.0	60.1
	16	58 23.0	21.8	293 43.9	5.2	18 09.8	2.9	60.1
	17	73 23.0	21.2	308 08.1	5.1	18 12.7	2.8	60.1
	18	88 23.0	N19 20.7	322 32.2	5.1	S18 15.5	2.6	60.1
	19	103 23.0	20.1	336 56.3	5.0	18 18.1	2.5	60.1
	20	118 23.0	19.6	351 20.3	5.0	18 20.6	2.4	60.2
	21	133 23.0	· · 19.0	5 44.3	5.0	18 23.0	2.2	60.2
	22	148 23.0	18.5	20 08.3	4.9	18 25.2	2.1	60.2
	23	163 23.0	17.9	34 32.2	5.0	18 27.3	2.0	60.2
		S.D. 15.8	d 0.5	S.D. 16.1		16.3		16.4

Lat.	Twilight		Sunrise	Moonrise			
	Naut.	Civil		24	25	26	27
°	h m	h m	h m	h m	h m	h m	h m
N 72	☐	☐	☐	15 51	18 06	■	■
N 70	☐	☐	☐	15 22	17 13	18 58	20 12
68	////	////	01 34	15 01	16 41	18 13	19 22
66	////	////	02 17	14 44	16 18	17 43	18 51
64	////	00 42	02 45	14 31	15 59	17 20	18 27
62	////	01 44	03 07	14 19	15 44	17 02	18 08
60	////	02 17	03 24	14 10	15 31	16 48	17 53
N 58	00 38	02 40	03 38	14 01	15 21	16 35	17 40
56	01 35	02 59	03 51	13 54	15 11	16 24	17 29
54	02 05	03 15	04 01	13 47	15 03	16 14	17 19
52	02 27	03 28	04 11	13 41	14 55	16 06	17 10
50	02 45	03 39	04 19	13 36	14 49	15 58	17 02
45	03 18	04 03	04 37	13 25	14 34	15 42	16 45
N 40	03 42	04 21	04 52	13 15	14 22	15 29	16 31
35	04 01	04 36	05 04	13 07	14 12	15 17	16 20
30	04 17	04 48	05 15	13 00	14 04	15 07	16 09
20	04 41	05 09	05 33	12 48	13 49	14 50	15 52
N 10	05 00	05 26	05 48	12 37	13 36	14 36	15 36
0	05 15	05 41	06 03	12 27	13 23	14 22	15 22
S 10	05 29	05 55	06 17	12 18	13 11	14 08	15 08
20	05 42	06 09	06 33	12 07	12 58	13 54	14 53
30	05 55	06 24	06 50	11 55	12 44	13 37	14 35
35	06 02	06 33	07 00	11 49	12 35	13 27	14 25
40	06 09	06 42	07 11	11 41	12 25	13 16	14 14
45	06 17	06 53	07 25	11 32	12 14	13 03	14 00
S 50	06 25	07 05	07 41	11 21	12 01	12 47	13 43
52	06 29	07 11	07 49	11 16	11 54	12 40	13 36
54	06 33	07 17	07 57	11 11	11 47	12 32	13 27
56	06 38	07 24	08 07	11 05	11 39	12 23	13 17
58	06 42	07 31	08 18	10 58	11 31	12 13	13 06
S 60	06 47	07 40	08 30	10 50	11 21	12 01	12 53

Lat.	Sunset	Twilight		Moonset			
		Civil	Naut.	24	25	26	27
°	h m	h m	h m	h m	h m	h m	h m
N 72	☐	☐	☐	21 15	20 58	■	■
N 70	☐	☐	☐	21 45	21 51	22 10	23 03
68	22 33	////	////	22 07	22 24	22 56	23 52
66	21 53	////	////	22 25	22 48	23 26	24 24
64	21 25	23 20	////	22 39	23 07	23 49	24 47
62	21 04	22 25	////	22 51	23 23	24 07	00 07
60	20 47	21 53	////	23 02	23 36	24 22	00 22
N 58	20 33	21 30	23 25	23 11	23 47	24 35	00 35
56	20 21	21 12	22 34	23 19	23 57	24 46	00 46
54	20 10	20 57	22 05	23 26	24 06	00 06	00 55
52	20 01	20 44	21 44	23 32	24 14	00 14	01 04
50	19 53	20 33	21 26	23 38	24 21	00 21	01 12
45	19 35	20 10	20 54	23 50	24 36	00 36	01 28
N 40	19 21	19 52	20 30	24 01	00 01	00 48	01 42
35	19 09	19 37	20 11	24 10	00 10	00 59	01 54
30	18 58	19 24	19 56	24 17	00 17	01 08	02 04
20	18 40	19 04	19 32	24 31	00 31	01 24	02 21
N 10	18 24	18 47	19 13	24 43	00 43	01 38	02 36
0	18 10	18 32	18 57	24 54	00 54	01 51	02 50
S 10	17 56	18 18	18 44	00 08	01 05	02 04	03 05
20	17 41	18 04	18 31	00 17	01 17	02 18	03 20
30	17 23	17 49	18 18	00 27	01 30	02 34	03 37
35	17 13	17 40	18 11	00 33	01 38	02 43	03 47
40	17 02	17 31	18 04	00 40	01 47	02 54	03 59
45	16 48	17 21	17 57	00 48	01 58	03 06	04 12
S 50	16 32	17 08	17 48	00 57	02 10	03 22	04 29
52	16 25	17 03	17 44	01 02	02 16	03 29	04 36
54	16 16	16 56	17 40	01 07	02 23	03 37	04 45
56	16 07	16 50	17 36	01 12	02 30	03 46	04 55
58	15 56	16 42	17 31	01 18	02 38	03 56	05 06
S 60	15 43	16 34	17 26	01 25	02 48	04 07	05 18

Day	SUN			MOON			
	Eqn. of Time 00ʰ	Eqn. of Time 12ʰ	Mer. Pass.	Mer. Pass. Upper	Mer. Pass. Lower	Age	Phase
	m s	m s	h m	h m	h m	d	
24	06 26	06 27	12 06	18 40	06 13	08	◐
25	06 27	06 28	12 06	19 37	07 08	09	
26	06 28	06 28	12 06	20 36	08 06	10	

1977 JULY 27, 28, 29 (WED., THURS., FRI.)

G.M.T.			ARIES	VENUS −3.6		MARS +1.2		JUPITER −1.6		SATURN +0.6	
			G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
d	h		° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
27	00		304 33.6	222 48.0	N21 05.7	239 51.4	N20 52.4	219 34.9	N22 56.0	163 36.2	N16 19.3
	01		319 36.1	237 47.5	05.9	254 52.0	52.7	234 36.8	56.0	178 38.4	19.2
	02		334 38.5	252 46.9	06.2	269 52.7	53.0	249 38.7	56.1	193 40.5	19.1
	03		349 41.0	267 46.4	· · 06.5	284 53.4	· · 53.4	264 40.6	· · 56.1	208 42.7	· · 19.0
	04		4 43.5	282 45.9	06.8	299 54.0	53.7	279 42.5	56.1	223 44.8	19.0
	05		19 45.9	297 45.3	07.0	314 54.7	54.0	294 44.5	56.1	238 47.0	18.9
	06		34 48.4	312 44.8	N21 07.3	329 55.4	N20 54.3	309 46.4	N22 56.1	253 49.1	N16 18.8
	07	WEDNESDAY	49 50.9	327 44.3	07.6	344 56.0	54.6	324 48.3	56.2	268 51.3	18.7
	08		64 53.3	342 43.7	07.8	359 56.7	55.0	339 50.2	56.2	283 53.5	18.6
	09		79 55.8	357 43.2	· · 08.1	14 57.4	· · 55.3	354 52.1	· · 56.2	298 55.6	· · 18.5
	10		94 58.2	12 42.7	08.4	29 58.0	55.6	9 54.0	56.2	313 57.8	18.4
	11		110 00.7	27 42.1	08.6	44 58.7	55.9	24 55.9	56.2	328 59.9	18.3
	12		125 03.2	42 41.6	N21 08.9	59 59.4	N20 56.2	39 57.8	N22 56.3	344 02.1	N16 18.2
	13		140 05.6	57 41.1	09.2	75 00.0	56.6	54 59.7	56.3	359 04.2	18.1
	14		155 08.1	72 40.5	09.4	90 00.7	56.9	70 01.7	56.3	14 06.4	18.0
	15		170 10.6	87 40.0	· · 09.7	105 01.4	· · 57.2	85 03.6	· · 56.3	29 08.5	· · 17.9
	16		185 13.0	102 39.5	10.0	120 02.0	57.5	100 05.5	56.3	44 10.7	17.8
	17		200 15.5	117 38.9	10.2	135 02.7	57.8	115 07.4	56.4	59 12.8	17.7
	18		215 18.0	132 38.4	N21 10.5	150 03.4	N20 58.2	130 09.3	N22 56.4	74 15.0	N16 17.6
	19		230 20.4	147 37.9	10.7	165 04.0	58.5	145 11.2	56.4	89 17.1	17.5
	20		245 22.9	162 37.3	11.0	180 04.7	58.8	160 13.1	56.4	104 19.3	17.4
	21		260 25.4	177 36.8	· · 11.3	195 05.4	· · 59.1	175 15.0	· · 56.4	119 21.4	· · 17.3
	22		275 27.8	192 36.2	11.5	210 06.1	59.4	190 17.0	56.4	134 23.6	17.2
	23		290 30.3	207 35.7	11.8	225 06.7	20 59.7	205 18.9	56.5	149 25.7	17.1
28	00		305 32.7	222 35.2	N21 12.0	240 07.4	N21 00.1	220 20.8	N22 56.5	164 27.9	N16 17.1
	01		320 35.2	237 34.6	12.3	255 08.1	00.4	235 22.7	56.5	179 30.0	17.0
	02		335 37.7	252 34.1	12.5	270 08.7	00.7	250 24.6	56.5	194 32.2	16.9
	03		350 40.1	267 33.5	· · 12.8	285 09.4	· · 01.0	265 26.5	· · 56.5	209 34.3	· · 16.8
	04		5 42.6	282 33.0	13.0	300 10.1	01.3	280 28.4	56.6	224 36.5	16.7
	05		20 45.1	297 32.5	13.3	315 10.7	01.6	295 30.3	56.6	239 38.6	16.6
	06		35 47.5	312 31.9	N21 13.5	330 11.4	N21 01.9	310 32.3	N22 56.6	254 40.8	N16 16.5
	07		50 50.0	327 31.4	13.8	345 12.1	02.3	325 34.2	56.6	269 43.0	16.4
	08	THURSDAY	65 52.5	342 30.8	14.0	0 12.7	02.6	340 36.1	56.6	284 45.1	16.3
	09		80 54.9	357 30.3	· · 14.3	15 13.4	· · 02.9	355 38.0	· · 56.7	299 47.3	· · 16.2
	10		95 57.4	12 29.7	14.5	30 14.1	03.2	10 39.9	56.7	314 49.4	16.1
	11		110 59.8	27 29.2	14.8	45 14.7	03.5	25 41.8	56.7	329 51.6	16.0
	12		126 02.3	42 28.7	N21 15.0	60 15.4	N21 03.8	40 43.7	N22 56.7	344 53.7	N16 15.9
	13		141 04.8	57 28.1	15.3	75 16.1	04.1	55 45.7	56.7	359 55.9	15.8
	14		156 07.2	72 27.6	15.5	90 16.8	04.4	70 47.6	56.7	14 58.0	15.7
	15		171 09.7	87 27.0	· · 15.7	105 17.4	· · 04.7	85 49.5	· · 56.8	30 00.2	· · 15.6
	16		186 12.2	102 26.5	16.0	120 18.1	05.1	100 51.4	56.8	45 02.3	15.5
	17		201 14.6	117 25.9	16.2	135 18.8	05.4	115 53.3	56.8	60 04.5	15.4
	18		216 17.1	132 25.4	N21 16.5	150 19.4	N21 05.7	130 55.2	N22 56.8	75 06.6	N16 15.3
	19		231 19.6	147 24.8	16.7	165 20.1	06.0	145 57.2	56.8	90 08.8	15.2
	20		246 22.0	162 24.3	16.9	180 20.8	06.3	160 59.1	56.9	105 10.9	15.1
	21		261 24.5	177 23.7	· · 17.2	195 21.4	· · 06.6	176 01.0	· · 56.9	120 13.1	· · 15.1
	22		276 27.0	192 23.2	17.4	210 22.1	06.9	191 02.9	56.9	135 15.2	15.0
	23		291 29.4	207 22.6	17.7	225 22.8	07.2	206 04.8	56.9	150 17.4	14.9
29	00		306 31.9	222 22.1	N21 17.9	240 23.4	N21 07.5	221 06.7	N22 56.9	165 19.5	N16 14.8
	01		321 34.3	237 21.5	18.1	255 24.1	07.8	236 08.6	57.0	180 21.7	14.7
	02		336 36.8	252 21.0	18.4	270 24.8	08.1	251 10.6	57.0	195 23.8	14.6
	03		351 39.3	267 20.4	· · 18.6	285 25.5	· · 08.4	266 12.5	· · 57.0	210 26.0	· · 14.5
	04		6 41.7	282 19.9	18.8	300 26.1	08.8	281 14.4	57.0	225 28.1	14.4
	05		21 44.2	297 19.3	19.1	315 26.8	09.1	296 16.3	57.0	240 30.3	14.3
	06		36 46.7	312 18.8	N21 19.3	330 27.5	N21 09.4	311 18.2	N22 57.0	255 32.4	N16 14.2
	07		51 49.1	327 18.2	19.5	345 28.1	09.7	326 20.1	57.1	270 34.6	14.1
	08		66 51.6	342 17.7	19.7	0 28.8	10.0	341 22.1	57.1	285 36.7	14.0
	09	FRIDAY	81 54.1	357 17.1	· · 20.0	15 29.5	· · 10.3	356 24.0	· · 57.1	300 38.9	· · 13.9
	10		96 56.5	12 16.6	20.2	30 30.1	10.6	11 25.9	57.1	315 41.0	13.8
	11		111 59.0	27 16.0	20.4	45 30.8	10.9	26 27.8	57.1	330 43.2	13.7
	12		127 01.4	42 15.5	N21 20.6	60 31.5	N21 11.2	41 29.7	N22 57.1	345 45.3	N16 13.6
	13		142 03.9	57 14.9	20.9	75 32.2	11.5	56 31.6	57.2	0 47.5	13.5
	14		157 06.4	72 14.3	21.1	90 32.8	11.8	71 33.6	57.2	15 49.6	13.4
	15		172 08.8	87 13.8	· · 21.3	105 33.5	· · 12.1	86 35.5	· · 57.2	30 51.8	· · 13.3
	16		187 11.3	102 13.2	21.5	120 34.2	12.4	101 37.4	57.2	45 54.0	13.2
	17		202 13.8	117 12.7	21.7	135 34.8	12.7	116 39.3	57.2	60 56.1	13.1
	18		217 16.2	132 12.1	N21 22.0	150 35.5	N21 13.0	131 41.2	N22 57.3	75 58.3	N16 13.0
	19		232 18.7	147 11.6	22.2	165 36.2	13.3	146 43.2	57.3	91 00.4	12.9
	20		247 21.2	162 11.0	22.4	180 36.8	13.6	161 45.1	57.3	106 02.6	12.9
	21		262 23.6	177 10.4	· · 22.6	195 37.5	· · 13.9	176 47.0	· · 57.3	121 04.7	· · 12.8
	22		277 26.1	192 09.9	22.8	210 38.2	14.2	191 48.9	57.3	136 06.9	12.7
	23		292 28.6	207 09.3	23.0	225 38.9	14.5	206 50.8	57.3	151 09.0	12.6
Mer. Pass.			h m 3 37.2	v −0.5	d 0.2	v 0.7	d 0.3	v 1.9	d 0.0	v 2.2	d 0.1

STARS

Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 38.9	S40 23.4
Achernar	335 46.8	S57 20.7
Acrux	173 39.8	S62 58.8
Adhara	255 34.1	S28 56.5
Aldebaran	291 20.6	N16 27.8
Alioth	166 44.6	N56 05.2
Alkaid	153 20.3	N49 25.8
Al Na'ir	28 17.2	S47 03.9
Alnilam	276 14.0	S 1 13.0
Alphard	218 22.9	S 8 33.7
Alphecca	126 33.8	N26 47.7
Alpheratz	358 11.3	N28 58.0
Altair	62 34.2	N 8 48.7
Ankaa	353 42.2	S42 25.4
Antares	112 59.2	S26 22.9
Arcturus	146 20.4	N19 18.1
Atria	108 24.9	S68 59.4
Avior	234 29.6	S59 26.3
Bellatrix	279 01.2	N 6 19.7
Betelgeuse	271 30.8	N 7 24.1
Canopus	264 08.6	S52 41.0
Capella	281 14.7	N45 58.4
Deneb	49 49.4	N45 12.2
Denebola	183 01.4	N14 41.9
Diphda	349 22.9	S18 06.4
Dubhe	194 25.3	N61 52.5
Elnath	278 47.1	N28 35.2
Eltanin	90 58.3	N51 29.8
Enif	34 13.3	N 9 46.5
Fomalhaut	15 53.5	S29 44.2
Gacrux	172 31.2	S56 59.5
Gienah	176 20.3	S17 25.1
Hadar	149 26.2	S60 16.1
Hamal	328 31.2	N23 21.3
Kaus Aust.	84 19.3	S34 23.7
Kochab	137 18.9	N74 15.2
Markab	14 05.0	N15 05.2
Menkar	314 43.4	N 4 00.1
Menkent	148 39.5	S36 15.7
Miaplacidus	221 46.2	S69 37.7
Mirfak	309 19.2	N49 46.7
Nunki	76 31.4	S26 19.4
Peacock	54 01.1	S56 48.3
Pollux	244 01.1	N28 04.8
Procyon	245 28.3	N 5 16.9
Rasalhague	96 31.3	N12 34.8
Regulus	208 12.5	N12 04.6
Rigel	281 38.3	S 8 13.6
Rigil Kent.	140 28.5	S60 44.7
Sabik	102 43.3	S15 41.7
Schedar	350 11.1	N56 24.7
Shaula	96 58.3	S37 05.3
Sirius	258 57.9	S16 41.1
Spica	158 59.8	S11 02.7
Suhail	223 12.7	S43 20.6
Vega	80 56.9	N38 46.0
Zuben'ubi	137 35.3	S15 56.9

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	277 02.4	9 10
Mars	294 34.6	7 59
Jupiter	274 48.0	9 17
Saturn	218 55.1	13 00

	G.M.T.	SUN G.H.A.	SUN Dec.	MOON G.H.A.	MOON *v*	MOON Dec.	MOON *d*	MOON H.P.
	d h	° ′	° ′	° ′	′	° ′	′	′
	27 00	178 23.1	N19 17.3	48 56.2	4.8	S18 29.3	1.9	60.2
	01	193 23.1	16.8	63 20.0	4.9	18 31.2	1.7	60.2
	02	208 23.1	16.2	77 43.9	4.8	18 32.9	1.6	60.2
	03	223 23.1	·· 15.6	92 07.7	4.8	18 34.5	1.5	60.2
	04	238 23.1	15.1	106 31.5	4.8	18 36.0	1.3	60.2
	05	253 23.1	14.5	120 55.3	4.8	18 37.3	1.2	60.2
	06	268 23.1	N19 14.0	135 19.1	4.7	S18 38.5	1.1	60.3
W	07	283 23.1	13.4	149 42.8	4.7	18 39.6	0.9	60.3
E	08	298 23.1	12.8	164 06.5	4.7	18 40.5	0.8	60.3
D	09	313 23.1	·· 12.3	178 30.2	4.7	18 41.3	0.7	60.3
N	10	328 23.1	11.7	192 53.9	4.7	18 42.0	0.6	60.3
E	11	343 23.1	11.1	207 17.6	4.6	18 42.6	0.4	60.3
S	12	358 23.1	N19 10.6	221 41.2	4.7	S18 43.0	0.3	60.3
D	13	13 23.1	10.0	236 04.9	4.6	18 43.3	0.1	60.3
A	14	28 23.1	09.4	250 28.5	4.6	18 43.4	0.0	60.3
Y	15	43 23.2	·· 08.9	264 52.1	4.7	18 43.4	0.1	60.3
	16	58 23.2	08.3	279 15.8	4.6	18 43.3	0.2	60.3
	17	73 23.2	07.7	293 39.4	4.6	18 43.1	0.4	60.3
	18	88 23.2	N19 07.2	308 03.0	4.6	S18 42.7	0.5	60.3
	19	103 23.2	06.6	322 26.6	4.6	18 42.2	0.7	60.3
	20	118 23.2	06.0	336 50.2	4.6	18 41.5	0.8	60.3
	21	133 23.2	·· 05.4	351 13.8	4.6	18 40.7	0.9	60.3
	22	148 23.2	04.9	5 37.4	4.6	18 39.8	1.0	60.3
	23	163 23.2	04.3	20 01.0	4.6	18 38.8	1.2	60.3
	28 00	178 23.2	N19 03.7	34 24.6	4.6	S18 37.6	1.3	60.3
	01	193 23.2	03.1	48 48.2	4.6	18 36.3	1.5	60.3
	02	208 23.3	02.6	63 11.8	4.6	18 34.8	1.6	60.3
	03	223 23.3	·· 02.0	77 35.4	4.7	18 33.2	1.7	60.3
	04	238 23.3	01.4	91 59.1	4.6	18 31.5	1.8	60.3
	05	253 23.3	00.8	106 22.7	4.7	18 29.7	2.0	60.3
	06	268 23.3	N19 00.3	120 46.4	4.7	S18 27.7	2.1	60.3
	07	283 23.3	18 59.7	135 10.1	4.7	18 25.6	2.2	60.3
T	08	298 23.3	59.1	149 33.8	4.7	18 23.4	2.4	60.3
H	09	313 23.3	·· 58.5	163 57.5	4.7	18 21.0	2.5	60.3
U	10	328 23.4	57.9	178 21.2	4.8	18 18.5	2.6	60.3
R	11	343 23.4	57.4	192 45.0	4.8	18 15.9	2.8	60.3
S	12	358 23.4	N18 56.8	207 08.8	4.8	S18 13.1	2.9	60.3
D	13	13 23.4	56.2	221 32.6	4.8	18 10.2	3.0	60.3
A	14	28 23.4	55.6	235 56.4	4.9	18 07.2	3.1	60.3
Y	15	43 23.4	·· 55.0	250 20.3	4.8	18 04.1	3.3	60.3
	16	58 23.4	54.5	264 44.1	5.0	18 00.8	3.4	60.3
	17	73 23.5	53.9	279 08.1	4.9	17 57.4	3.5	60.3
	18	88 23.5	N18 53.3	293 32.0	5.0	S17 53.9	3.6	60.3
	19	103 23.5	52.7	307 56.0	5.0	17 50.3	3.8	60.3
	20	118 23.5	52.1	322 20.0	5.0	17 46.5	3.9	60.3
	21	133 23.5	·· 51.5	336 44.0	5.1	17 42.6	4.0	60.3
	22	148 23.5	51.0	351 08.1	5.1	17 38.6	4.2	60.2
	23	163 23.6	50.4	5 32.2	5.2	17 34.4	4.2	60.2
	29 00	178 23.6	N18 49.8	19 56.4	5.2	S17 30.2	4.4	60.2
	01	193 23.6	49.2	34 20.6	5.2	17 25.8	4.5	60.2
	02	208 23.6	48.6	48 44.8	5.3	17 21.3	4.6	60.2
	03	223 23.6	·· 48.0	63 09.1	5.3	17 16.7	4.8	60.2
	04	238 23.6	47.4	77 33.4	5.4	17 11.9	4.8	60.2
	05	253 23.7	46.8	91 57.8	5.4	17 07.1	5.0	60.2
	06	268 23.7	N18 46.3	106 22.2	5.4	S17 02.1	5.1	60.2
	07	283 23.7	45.7	120 46.6	5.6	16 57.0	5.2	60.2
	08	298 23.7	45.1	135 11.2	5.5	16 51.8	5.3	60.1
F	09	313 23.7	·· 44.5	149 35.7	5.6	16 46.5	5.4	60.1
R	10	328 23.8	43.9	164 00.3	5.7	16 41.1	5.6	60.1
I	11	343 23.8	43.3	178 25.0	5.7	16 35.5	5.6	60.1
D	12	358 23.8	N18 42.7	192 49.7	5.7	S16 29.9	5.8	60.1
A	13	13 23.8	42.1	207 14.4	5.9	16 24.1	5.9	60.1
Y	14	28 23.8	41.5	221 39.3	5.8	16 18.2	5.9	60.1
	15	43 23.9	·· 40.9	236 04.1	6.0	16 12.3	6.1	60.1
	16	58 23.9	40.3	250 29.1	5.9	16 06.2	6.2	60.0
	17	73 23.9	39.7	264 54.0	6.1	16 00.0	6.3	60.0
	18	88 23.9	N18 39.1	279 19.1	6.1	S15 53.7	6.4	60.0
	19	103 23.9	38.5	293 44.2	6.1	15 47.3	6.5	60.0
	20	118 24.0	37.9	308 09.3	6.3	15 40.8	6.6	60.0
	21	133 24.0	·· 37.3	322 34.6	6.2	15 34.2	6.7	60.0
	22	148 24.0	36.7	336 59.8	6.4	15 27.5	6.8	59.9
	23	163 24.0	36.1	351 25.2	6.4	15 20.7	6.9	59.9
		S.D. 15.8	*d* 0.6	S.D. 16.4		16.4		16.4

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 27	Moonrise 28	Moonrise 29	Moonrise 30
°	h m	h m	h m	h m	h m	h m	h m
N 72	▭	▭	▭	■	22 01	21 30	21 18
N 70	////	////	00 31	20 12	20 42	20 53	20 56
68	////	////	01 52	19 22	20 04	20 26	20 39
66	////	////	02 29	18 51	19 37	20 06	20 25
64	////	01 11	02 55	18 27	19 16	19 50	20 13
62	////	01 58	03 15	18 08	18 59	19 36	20 03
60	////	02 27	03 31	17 53	18 45	19 24	19 54
N 58	01 05	02 48	03 44	17 40	18 33	19 14	19 47
56	01 47	03 06	03 56	17 29	18 22	19 06	19 40
54	02 14	03 20	04 06	17 19	18 13	18 58	19 34
52	02 34	03 33	04 15	17 10	18 05	18 51	19 29
50	02 51	03 44	04 23	17 02	17 57	18 44	19 24
45	03 22	04 06	04 40	16 45	17 42	18 31	19 13
N 40	03 46	04 24	04 54	16 31	17 29	18 20	19 04
35	04 04	04 38	05 06	16 20	17 17	18 10	18 57
30	04 19	04 50	05 16	16 09	17 08	18 01	18 50
20	04 42	05 10	05 34	15 52	16 51	17 47	18 38
N 10	05 00	05 27	05 49	15 36	16 36	17 34	18 28
0	05 16	05 41	06 03	15 22	16 23	17 22	18 19
S 10	05 29	05 55	06 17	15 08	16 09	17 10	18 09
20	05 41	06 08	06 31	14 53	15 54	16 57	17 59
30	05 54	06 23	06 48	14 35	15 38	16 42	17 47
35	06 00	06 31	06 58	14 25	15 28	16 34	17 40
40	06 07	06 40	07 09	14 14	15 17	16 24	17 33
45	06 14	06 50	07 22	14 00	15 04	16 13	17 24
S 50	06 22	07 02	07 37	13 43	14 48	15 59	17 13
52	06 26	07 07	07 45	13 36	14 40	15 52	17 08
54	06 29	07 13	07 53	13 27	14 32	15 45	17 02
56	06 33	07 19	08 02	13 17	14 23	15 37	16 56
58	06 38	07 26	08 12	13 06	14 12	15 28	16 49
S 60	06 42	07 35	08 24	12 53	14 00	15 17	16 41

Lat.	Sunset	Twilight Civil	Twilight Naut.	Moonset 27	Moonset 28	Moonset 29	Moonset 30
°	h m	h m	h m	h m	h m	h m	h m
N 72	▭	▭	▭	■	23 21	25 55	01 55
N 70	23 23	////	////	23 03	24 39	00 39	02 31
68	22 16	////	////	23 52	25 17	01 17	02 57
66	21 41	////	////	24 24	00 24	01 43	03 16
64	21 16	22 55	////	24 47	00 47	02 04	03 32
62	20 56	22 12	////	00 07	01 06	02 20	03 45
60	20 40	21 44	////	00 22	01 21	02 34	03 56
N 58	20 27	21 23	23 02	00 35	01 34	02 46	04 05
56	20 16	21 05	22 22	00 46	01 46	02 56	04 13
54	20 06	20 51	21 57	00 55	01 55	03 05	04 21
52	19 57	20 39	21 37	01 04	02 04	03 13	04 27
50	19 49	20 28	21 20	01 12	02 12	03 20	04 33
45	19 32	20 06	20 49	01 28	02 29	03 36	04 46
N 40	19 18	19 49	20 26	01 42	02 43	03 48	04 56
35	19 06	19 34	20 08	01 54	02 54	03 59	05 05
30	18 56	19 22	19 54	02 04	03 04	04 08	05 13
20	18 39	19 02	19 30	02 21	03 22	04 24	05 27
N 10	18 24	18 46	19 12	02 36	03 37	04 38	05 38
0	18 10	18 32	18 57	02 50	03 51	04 51	05 49
S 10	17 56	18 18	18 44	03 05	04 05	05 04	06 00
20	17 42	18 05	18 32	03 20	04 20	05 18	06 12
30	17 25	17 50	18 19	03 37	04 37	05 34	06 25
35	17 15	17 42	18 13	03 47	04 47	05 43	06 32
40	17 04	17 34	18 06	03 59	04 59	05 53	06 41
45	16 52	17 24	17 59	04 12	05 12	06 05	06 51
S 50	16 36	17 12	17 51	04 29	05 28	06 20	07 03
52	16 29	17 06	17 48	04 36	05 36	06 27	07 08
54	16 21	17 01	17 44	04 45	05 44	06 34	07 14
56	16 12	16 54	17 40	04 55	05 54	06 42	07 21
58	16 01	16 47	17 36	05 06	06 05	06 52	07 29
S 60	15 49	16 39	17 31	05 18	06 17	07 03	07 37

Day	SUN Eqn. of Time 00ʰ	SUN Eqn. of Time 12ʰ	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
	m s	m s	h m	h m	h m	d	
27	06 28	06 28	12 06	21 37	09 06	11	○
28	06 27	06 26	12 06	22 37	10 07	12	
29	06 26	06 25	12 06	23 36	11 07	13	

1977 JULY 30, 31, AUG. 1 (SAT., SUN., MON.)

G.M.T. d	h	ARIES G.H.A. ° ′	VENUS −3.6 G.H.A. ° ′	VENUS −3.6 Dec ° ′	MARS +1.2 G.H.A. ° ′	MARS +1.2 Dec. ° ′	JUPITER −1.6 G.H.A. ° ′	JUPITER −1.6 Dec. ° ′	SATURN +0.6 G.H.A. ° ′	SATURN +0.6 Dec ° ′
30	00	307 31.0	222 08.8	N21 23.3	240 39.5	N21 14.8	221 52.8	N22 57.4	166 11.2	N16 12.5
	01	322 33.5	237 08.2	23.5	255 40.2	15.1	236 54.7	57.4	181 13.3	12.4
	02	337 35.9	252 07.6	23.7	270 40.9	15.4	251 56.6	57.4	196 15.5	12.3
	03	352 38.4	267 07.1	·· 23.9	285 41.5	·· 15.7	266 58.5	·· 57.4	211 17.6	·· 12.2
	04	7 40.9	282 06.5	24.1	300 42.2	16.0	282 00.4	57.4	226 19.8	12.1
	05	22 43.3	297 06.0	24.3	315 42.9	16.3	297 02.4	57.4	241 21.9	12.0
	06	37 45.8	312 05.4	N21 24.5	330 43.6	N21 16.6	312 04.3	N22 57.5	256 24.1	N16 11.9
	07	52 48.3	327 04.8	24.7	345 44.2	16.9	327 06.2	57.5	271 26.2	11.8
S	08	67 50.7	342 04.3	24.9	0 44.9	17.2	342 08.1	57.5	286 28.4	11.7
A	09	82 53.2	357 03.7	·· 25.1	15 45.6	·· 17.5	357 10.0	·· 57.5	301 30.5	·· 11.6
T	10	97 55.7	12 03.1	25.3	30 46.2	17.8	12 12.0	57.5	316 32.7	11.5
U	11	112 58.1	27 02.6	25.5	45 46.9	18.1	27 13.9	57.5	331 34.8	11.4
R	12	128 00.6	42 02.0	N21 25.7	60 47.6	N21 18.4	42 15.8	N22 57.6	346 37.0	N16 11.3
D	13	143 03.1	57 01.5	25.9	75 48.2	18.7	57 17.7	57.6	1 39.1	11.2
A	14	158 05.5	72 00.9	26.1	90 48.9	19.0	72 19.6	57.6	16 41.3	11.1
Y	15	173 08.0	87 00.3	·· 26.3	105 49.6	·· 19.3	87 21.6	·· 57.6	31 43.4	·· 11.0
	16	188 10.4	101 59.8	26.5	120 50.3	19.5	102 23.5	57.6	46 45.6	10.9
	17	203 12.9	116 59.2	26.7	135 50.9	19.8	117 25.4	57.6	61 47.7	10.8
	18	218 15.4	131 58.6	N21 26.9	150 51.6	N21 20.1	132 27.3	N22 57.7	76 49.9	N16 10.7
	19	233 17.8	146 58.1	27.1	165 52.3	20.4	147 29.2	57.7	91 52.0	10.6
	20	248 20.3	161 57.5	27.3	180 52.9	20.7	162 31.2	57.7	106 54.2	10.6
	21	263 22.8	176 56.9	·· 27.5	195 53.6	·· 21.0	177 33.1	·· 57.7	121 56.3	·· 10.5
	22	278 25.2	191 56.3	27.7	210 54.3	21.3	192 35.0	57.7	136 58.5	10.4
	23	293 27.7	206 55.8	27.9	225 55.0	21.6	207 36.9	57.7	152 00.6	10.3
31	00	308 30.2	221 55.2	N21 28.1	240 55.6	N21 21.9	222 38.8	N22 57.8	167 02.8	N16 10.2
	01	323 32.6	236 54.6	28.3	255 56.3	22.2	237 40.8	57.8	182 04.9	10.1
	02	338 35.1	251 54.1	28.5	270 57.0	22.5	252 42.7	57.8	197 07.1	10.0
	03	353 37.5	266 53.5	·· 28.7	285 57.6	·· 22.8	267 44.6	·· 57.8	212 09.2	·· 09.9
	04	8 40.0	281 52.9	28.9	300 58.3	23.1	282 46.5	57.8	227 11.4	09.8
	05	23 42.5	296 52.4	29.0	315 59.0	23.3	297 48.5	57.8	242 13.5	09.7
	06	38 44.9	311 51.8	N21 29.2	330 59.7	N21 23.6	312 50.4	N22 57.9	257 15.7	N16 09.6
	07	53 47.4	326 51.2	29.4	346 00.3	23.9	327 52.3	57.9	272 17.8	09.5
	08	68 49.9	341 50.6	29.6	1 01.0	24.2	342 54.2	57.9	287 20.0	09.4
S	09	83 52.3	356 50.1	·· 29.8	16 01.7	·· 24.5	357 56.2	·· 57.9	302 22.1	·· 09.3
U	10	98 54.8	11 49.5	30.0	31 02.4	24.8	12 58.1	57.9	317 24.3	09.2
N	11	113 57.3	26 48.9	30.1	46 03.0	25.1	28 00.0	57.9	332 26.4	09.1
D	12	128 59.7	41 48.3	N21 30.3	61 03.7	N21 25.4	43 01.9	N22 58.0	347 28.6	N16 09.0
A	13	144 02.2	56 47.8	30.5	76 04.4	25.6	58 03.9	58.0	2 30.7	08.9
Y	14	159 04.7	71 47.2	30.7	91 05.0	25.9	73 05.8	58.0	17 32.9	08.8
	15	174 07.1	86 46.6	·· 30.9	106 05.7	·· 26.2	88 07.7	·· 58.0	32 35.0	·· 08.7
	16	189 09.6	101 46.0	31.0	121 06.4	26.5	103 09.6	58.0	47 37.2	08.6
	17	204 12.0	116 45.5	31.2	136 07.1	26.8	118 11.5	58.0	62 39.3	08.5
	18	219 14.5	131 44.9	N21 31.4	151 07.7	N21 27.1	133 13.5	N22 58.1	77 41.5	N16 08.4
	19	234 17.0	146 44.3	31.6	166 08.4	27.4	148 15.4	58.1	92 43.6	08.3
	20	249 19.4	161 43.7	31.7	181 09.1	27.6	163 17.3	58.1	107 45.8	08.2
	21	264 21.9	176 43.2	·· 31.9	196 09.7	·· 27.9	178 19.2	·· 58.1	122 47.9	·· 08.1
	22	279 24.4	191 42.6	32.1	211 10.4	28.2	193 21.2	58.1	137 50.1	08.1
	23	294 26.8	206 42.0	32.3	226 11.1	28.5	208 23.1	58.1	152 52.2	08.0
1	00	309 29.3	221 41.4	N21 32.4	241 11.8	N21 28.8	223 25.0	N22 58.1	167 54.4	N16 07.9
	01	324 31.8	236 40.8	32.6	256 12.4	29.1	238 26.9	58.2	182 56.5	07.8
	02	339 34.2	251 40.3	32.8	271 13.1	29.3	253 28.9	58.2	197 58.7	07.7
	03	354 36.7	266 39.7	·· 32.9	286 13.8	·· 29.6	268 30.8	·· 58.2	213 00.8	·· 07.6
	04	9 39.2	281 39.1	33.1	301 14.5	29.9	283 32.7	58.2	228 03.0	07.5
	05	24 41.6	296 38.5	33.3	316 15.1	30.2	298 34.7	58.2	243 05.1	07.4
	06	39 44.1	311 37.9	N21 33.4	331 15.8	N21 30.5	313 36.6	N22 58.2	258 07.3	N16 07.3
	07	54 46.5	326 37.4	33.6	346 16.5	30.8	328 38.5	58.3	273 09.4	07.2
	08	69 49.0	341 36.8	33.8	1 17.2	31.0	343 40.4	58.3	288 11.6	07.1
M	09	84 51.5	356 36.2	·· 33.9	16 17.8	·· 31.3	358 42.4	·· 58.3	303 13.7	·· 07.0
O	10	99 53.9	11 35.6	34.1	31 18.5	31.6	13 44.3	58.3	318 15.9	06.9
N	11	114 56.4	26 35.0	34.2	46 19.2	31.9	28 46.2	58.3	333 18.0	06.8
D	12	129 58.9	41 34.5	N21 34.4	61 19.8	N21 32.2	43 48.1	N22 58.3	348 20.2	N16 06.7
A	13	145 01.3	56 33.9	34.6	76 20.5	32.4	58 50.1	58.3	3 22.3	06.6
Y	14	160 03.8	71 33.3	34.7	91 21.2	32.7	73 52.0	58.4	18 24.5	06.5
	15	175 06.3	86 32.7	·· 34.9	106 21.9	·· 33.0	88 53.9	·· 58.4	33 26.6	·· 06.4
	16	190 08.7	101 32.1	35.0	121 22.5	33.3	103 55.8	58.4	48 28.8	06.3
	17	205 11.2	116 31.5	35.2	136 23.2	33.5	118 57.8	58.4	63 30.9	06.2
	18	220 13.7	131 31.0	N21 35.3	151 23.9	N21 33.8	133 59.7	N22 58.4	78 33.1	N16 06.1
	19	235 16.1	146 30.4	35.5	166 24.6	34.1	149 01.6	58.4	93 35.2	06.0
	20	250 18.6	161 29.8	35.6	181 25.2	34.4	164 03.6	58.5	108 37.4	05.9
	21	265 21.0	176 29.2	·· 35.8	196 25.9	·· 34.6	179 05.5	·· 58.5	123 39.5	·· 05.8
	22	280 23.5	191 28.6	35.9	211 26.6	34.9	194 07.4	58.5	138 41.7	05.7
	23	295 26.0	206 28.0	36.1	226 27.3	35.2	209 09.3	58.5	153 43.8	05.6
Mer. Pass.		h m 3 25.4	v −0.6	d 0.2	v 0.7	d 0.3	v 1.9	d 0.0	v 2.2	d 0.1

STARS

Name	S.H.A. ° ′	Dec. ° ′
Acamar	315 38.9	S40 23.4
Achernar	335 46.8	S57 20.7
Acrux	173 39.8	S62 58.8
Adhara	255 34.1	S28 56.5
Aldebaran	291 20.6	N16 27.8
Alioth	166 44.7	N56 05.2
Alkaid	153 20.3	N49 25.8
Al Na'ir	28 17.2	S47 03.9
Alnilam	276 14.0	S 1 13.0
Alphard	218 22.9	S 8 33.7
Alphecca	126 33.8	N26 47.7
Alpheratz	358 11.2	N28 58.0
Altair	62 34.2	N 8 48.7
Ankaa	353 42.1	S42 25.4
Antares	112 59.2	S26 22.9
Arcturus	146 20.4	N19 18.1
Atria	108 24.9	S68 59.4
Avior	234 29.6	S59 26.3
Bellatrix	279 01.2	N 6 19.7
Betelgeuse	271 30.8	N 7 24.2
Canopus	264 08.6	S52 40.9
Capella	281 14.7	N45 58.4
Deneb	49 49.4	N45 12.2
Denebola	183 01.4	N14 41.9
Diphda	349 22.8	S18 06.4
Dubhe	194 25.3	N61 52.5
Elnath	278 47.0	N28 35.2
Eltanin	90 58.3	N51 29.8
Enif	34 13.3	N 9 46.5
Fomalhaut	15 53.5	S29 44.2
Gacrux	172 31.3	S56 59.5
Gienah	176 20.3	S17 25.1
Hadar	149 26.3	S60 16.1
Hamal	328 31.2	N23 21.3
Kaus Aust.	84 19.3	S34 23.7
Kochab	137 18.9	N74 15.2
Markab	14 05.0	N15 05.2
Menkar	314 43.4	N 4 00.1
Menkent	148 39.5	S36 15.7
Miaplacidus	221 46.2	S69 37.7
Mirfak	309 19.2	N49 46.7
Nunki	76 31.4	S26 19.4
Peacock	54 01.1	S56 48.3
Pollux	244 01.1	N28 04.8
Procyon	245 28.3	N 5 16.9
Rasalhague	96 31.3	N12 34.8
Regulus	208 12.5	N12 04.6
Rigel	281 38.2	S 8 13.6
Rigil Kent.	140 28.5	S60 44.7
Sabik	102 43.3	S15 41.8
Schedar	350 11.0	N56 24.7
Shaula	96 58.3	S37 05.3
Sirius	258 57.9	S16 41.1
Spica	158 59.8	S11 02.7
Suhail	223 12.7	S43 20.6
Vega	80 56.9	N38 46.0
Zuben'ubi	137 35.3	S15 56.9

	S.H.A. ° ′	Mer. Pass. h m
Venus	273 25.1	9 13
Mars	292 25.5	7 56
Jupiter	274 08.7	9 08
Saturn	218 32.6	12 50

G.M.T.	SUN G.H.A.	SUN Dec.	MOON G.H.A.	v	MOON Dec.	d	H.P.
d h	° ′	° ′	° ′	′	° ′	′	′
30 00	178 24.1	N18 35.5	5 50.6	6.5	S15 13.8	7.0	59.9
01	193 24.1	34.9	20 16.1	6.5	15 06.8	7.1	59.9
02	208 24.1	34.3	34 41.6	6.6	14 59.7	7.2	59.9
03	223 24.1	·· 33.7	49 07.2	6.6	14 52.5	7.3	59.8
04	238 24.2	33.1	63 32.8	6.8	14 45.2	7.3	59.8
05	253 24.2	32.5	77 58.6	6.8	14 37.9	7.5	59.8
06	268 24.2	N18 31.9	92 24.4	6.8	S14 30.4	7.6	59.8
07	283 24.2	31.3	106 50.2	6.9	14 22.8	7.6	59.8
S 08	298 24.3	30.7	121 16.1	7.0	14 15.2	7.7	59.7
A 09	313 24.3	·· 30.1	135 42.1	7.1	14 07.5	7.8	59.7
T 10	328 24.3	29.5	150 08.2	7.1	13 59.7	7.9	59.7
U 11	343 24.3	28.9	164 34.3	7.2	13 51.8	8.0	59.7
R 12	358 24.4	N18 28.3	179 00.5	7.3	S13 43.8	8.1	59.7
D 13	13 24.4	27.7	193 26.8	7.3	13 35.7	8.1	59.6
A 14	28 24.4	27.1	207 53.1	7.4	13 27.6	8.2	59.6
Y 15	43 24.4	·· 26.5	222 19.5	7.5	13 19.4	8.3	59.6
16	58 24.5	25.9	236 46.0	7.5	13 11.1	8.4	59.6
17	73 24.5	25.3	251 12.5	7.6	13 02.7	8.4	59.5
18	88 24.5	N18 24.7	265 39.1	7.7	S12 54.3	8.6	59.5
19	103 24.6	24.0	280 05.8	7.7	12 45.7	8.5	59.5
20	118 24.6	23.4	294 32.5	7.9	12 37.2	8.7	59.5
21	133 24.6	·· 22.8	308 59.4	7.9	12 28.5	8.7	59.4
22	148 24.6	22.2	323 26.3	7.9	12 19.8	8.9	59.4
23	163 24.7	21.6	337 53.2	8.1	12 10.9	8.8	59.4
31 00	178 24.7	N18 21.0	352 20.3	8.1	S12 02.1	9.0	59.4
01	193 24.7	20.4	6 47.4	8.1	11 53.1	9.0	59.3
02	208 24.8	19.8	21 14.5	8.3	11 44.1	9.0	59.3
03	223 24.8	·· 19.1	35 41.8	8.3	11 35.1	9.1	59.3
04	238 24.8	18.5	50 09.1	8.4	11 26.0	9.2	59.3
05	253 24.9	17.9	64 36.5	8.5	11 16.8	9.3	59.2
06	268 24.9	N18 17.3	79 04.0	8.5	S11 07.5	9.3	59.2
07	283 24.9	16.7	93 31.5	8.6	10 58.2	9.3	59.2
08	298 24.9	16.1	107 59.1	8.7	10 48.9	9.5	59.1
S 09	313 25.0	·· 15.5	122 26.8	8.7	10 39.4	9.4	59.1
U 10	328 25.0	14.8	136 54.5	8.8	10 30.0	9.5	59.1
N 11	343 25.0	14.2	151 22.3	8.9	10 20.5	9.6	59.1
D 12	358 25.1	N18 13.6	165 50.2	9.0	S10 10.9	9.6	59.0
A 13	13 25.1	13.0	180 18.2	9.0	10 01.3	9.7	59.0
Y 14	28 25.1	12.4	194 46.2	9.1	9 51.6	9.7	59.0
15	43 25.2	·· 11.7	209 14.3	9.1	9 41.9	9.8	58.9
16	58 25.2	11.1	223 42.4	9.3	9 32.1	9.8	58.9
17	73 25.2	10.5	238 10.7	9.3	9 22.3	9.9	58.9
18	88 25.3	N18 09.9	252 39.0	9.4	S 9 12.4	9.9	58.8
19	103 25.3	09.3	267 07.4	9.4	9 02.5	9.9	58.8
20	118 25.3	08.6	281 35.8	9.5	8 52.6	10.0	58.8
21	133 25.4	·· 08.0	296 04.3	9.6	8 42.6	10.0	58.8
22	148 25.4	07.4	310 32.9	9.6	8 32.6	10.0	58.7
23	163 25.5	06.8	325 01.5	9.7	8 22.6	10.1	58.7
1 00	178 25.5	N18 06.1	339 30.2	9.8	S 8 12.5	10.2	58.7
01	193 25.5	05.5	353 59.0	9.9	8 02.3	10.1	58.6
02	208 25.6	04.9	8 27.9	9.9	7 52.2	10.2	58.6
03	223 25.6	·· 04.3	22 56.8	10.0	7 42.0	10.2	58.6
04	238 25.6	03.6	37 25.8	10.0	7 31.8	10.3	58.5
05	253 25.7	03.0	51 54.8	10.1	7 21.5	10.3	58.5
06	268 25.7	N18 02.4	66 23.9	10.2	S 7 11.2	10.3	58.5
07	283 25.7	01.8	80 53.1	10.2	7 00.9	10.3	58.4
08	298 25.8	01.1	95 22.3	10.3	6 50.6	10.4	58.4
M 09	313 25.8	18 00.5	109 51.6	10.4	6 40.2	10.4	58.4
O 10	328 25.9	17 59.9	124 21.0	10.4	6 29.8	10.4	58.3
N 11	343 25.9	59.2	138 50.4	10.5	6 19.4	10.4	58.3
D 12	358 25.9	N17 58.6	153 19.9	10.5	S 6 09.0	10.4	58.3
A 13	13 26.0	58.0	167 49.4	10.6	5 58.6	10.5	58.2
Y 14	28 26.0	57.3	182 19.0	10.7	5 48.1	10.5	58.2
15	43 26.1	·· 56.7	196 48.7	10.7	5 37.6	10.5	58.2
16	58 26.1	56.1	211 18.4	10.8	5 27.1	10.5	58.1
17	73 26.1	55.4	225 48.2	10.9	5 16.6	10.6	58.1
18	88 26.2	N17 54.8	240 18.1	10.9	S 5 06.0	10.5	58.1
19	103 26.2	54.2	254 48.0	10.9	4 55.5	10.6	58.0
20	118 26.3	53.5	269 17.9	11.1	4 44.9	10.5	58.0
21	133 26.3	·· 52.9	283 48.0	11.0	4 34.4	10.6	58.0
22	148 26.3	52.3	298 18.0	11.2	4 23.8	10.6	57.9
23	163 26.4	51.6	312 48.2	11.2	4 13.2	10.6	57.9
	S.D. 15.8	d 0.6	S.D. 16.3		16.1		15.9

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 30	Moonrise 31	Moonrise 1	Moonrise 2
°	h m	h m	h m	h m	h m	h m	h m
N 72	□	□	□	21 18	21 10	21 04	20 57
N 70	////	////	01 15	20 56	20 57	20 57	20 57
68	////	////	02 09	20 39	20 46	20 52	20 56
66	////	////	02 41	20 25	20 38	20 47	20 56
64	////	01 32	03 04	20 13	20 30	20 44	20 56
62	////	02 10	03 23	20 03	20 24	20 40	20 55
60	////	02 36	03 38	19 54	20 18	20 37	20 55
N 58	01 24	02 56	03 51	19 47	20 13	20 35	20 55
56	01 58	03 13	04 02	19 40	20 08	20 33	20 55
54	02 23	03 26	04 11	19 34	20 04	20 31	20 54
52	02 41	03 38	04 20	19 29	20 01	20 29	20 54
50	02 57	03 49	04 27	19 24	19 57	20 27	20 54
45	03 27	04 10	04 44	19 13	19 50	20 23	20 54
N 40	03 49	04 27	04 57	19 04	19 44	20 20	20 53
35	04 07	04 40	05 08	18 57	19 39	20 17	20 53
30	04 21	04 52	05 18	18 50	19 34	20 15	20 53
20	04 44	05 11	05 35	18 38	19 26	20 11	20 53
N 10	05 01	05 27	05 49	18 28	19 19	20 07	20 52
0	05 16	05 41	06 03	18 19	19 13	20 03	20 52
S 10	05 29	05 54	06 16	18 09	19 06	20 00	20 52
20	05 40	06 07	06 30	17 59	18 59	19 56	20 51
30	05 52	06 21	06 46	17 47	18 51	19 52	20 51
35	05 58	06 29	06 55	17 40	18 46	19 50	20 51
40	06 04	06 37	07 06	17 33	18 41	19 47	20 51
45	06 11	06 47	07 18	17 24	18 35	19 44	20 51
S 50	06 19	06 58	07 33	17 13	18 27	19 40	20 51
52	06 22	07 03	07 40	17 08	18 24	19 38	20 50
54	06 25	07 08	07 48	17 02	18 20	19 36	20 50
56	06 29	07 14	07 56	16 56	18 16	19 34	20 50
58	06 33	07 21	08 06	16 49	18 11	19 32	20 50
S 60	06 37	07 29	08 17	16 41	18 06	19 29	20 50

Lat.	Sunset	Twilight Civil	Twilight Naut.	Moonset 30	Moonset 31	Moonset 1	Moonset 2
°	h m	h m	h m	h m	h m	h m	h m
N 72	□	□	□	01 55	04 03	06 01	07 52
N 70	22 49	////	////	02 31	04 24	06 12	07 56
68	22 00	////	////	02 57	04 40	06 21	07 59
66	21 29	////	////	03 16	04 53	06 29	08 02
64	21 06	22 35	////	03 32	05 04	06 35	08 04
62	20 48	21 59	////	03 45	05 13	06 41	08 06
60	20 33	21 34	////	03 56	05 21	06 45	08 08
N 58	20 21	21 14	22 44	04 05	05 27	06 49	08 09
56	20 10	20 58	22 11	04 13	05 33	06 53	08 11
54	20 00	20 45	21 48	04 21	05 39	06 56	08 12
52	19 52	20 33	21 29	04 27	05 44	06 59	08 13
50	19 44	20 23	21 14	04 33	05 48	07 02	08 14
45	19 28	20 02	20 45	04 46	05 57	07 08	08 16
N 40	19 15	19 45	20 23	04 56	06 05	07 13	08 18
35	19 04	19 32	20 05	05 05	06 12	07 17	08 19
30	18 54	19 20	19 51	05 13	06 18	07 20	08 21
20	18 38	19 01	19 29	05 27	06 28	07 27	08 23
N 10	18 23	18 45	19 11	05 38	06 37	07 32	08 25
0	18 10	18 32	18 57	05 49	06 45	07 37	08 27
S 10	17 57	18 19	18 44	06 00	06 53	07 42	08 29
20	17 43	18 06	18 32	06 12	07 01	07 48	08 31
30	17 27	17 52	18 21	06 25	07 11	07 54	08 33
35	17 18	17 44	18 15	06 32	07 17	07 57	08 34
40	17 07	17 36	18 09	06 41	07 23	08 01	08 35
45	16 55	17 27	18 02	06 51	07 30	08 05	08 37
S 50	16 40	17 15	17 55	07 03	07 39	08 11	08 39
52	16 33	17 10	17 52	07 08	07 43	08 13	08 40
54	16 25	17 05	17 48	07 14	07 48	08 16	08 41
56	16 17	16 59	17 44	07 21	07 53	08 19	08 42
58	16 07	16 52	17 41	07 29	07 58	08 22	08 43
S 60	15 56	16 45	17 36	07 37	08 04	08 26	08 44

Day	SUN Eqn. of Time 00ʰ	SUN Eqn. of Time 12ʰ	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	Age	Phase
	m s	m s	h m	h m	h m	d	
30	06 24	06 23	12 06	24 32	12 04	14	
31	06 21	06 20	12 06	00 32	12 59	15	○
1	06 18	06 16	12 06	01 25	13 50	16	

1977 AUGUST 2, 3, 4 (TUES., WED., THURS.)

G.M.T.		ARIES	VENUS −3.6		MARS +1.1		JUPITER −1.6		SATURN +0.6	
		G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
d	h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
2	00	310 28.4	221 27.4	N21 36.2	241 27.9	N21 35.5	224 11.3	N22 58.5	168 46.0	N16 05.5
	01	325 30.9	236 26.8	36.4	256 28.6	35.8	239 13.2	58.5	183 48.1	05.4
	02	340 33.4	251 26.3	36.5	271 29.3	36.0	254 15.1	58.5	198 50.3	05.3
	03	355 35.8	266 25.7	·· 36.7	286 30.0	·· 36.3	269 17.1	·· 58.6	213 52.4	·· 05.3
	04	10 38.3	281 25.1	36.8	301 30.6	36.6	284 19.0	58.6	228 54.6	05.2
	05	25 40.8	296 24.5	36.9	316 31.3	36.8	299 20.9	58.6	243 56.7	05.1
	06	40 43.2	311 23.9	N21 37.1	331 32.0	N21 37.1	314 22.8	N22 58.6	258 58.9	N16 05.0
	07	55 45.7	326 23.3	37.2	346 32.7	37.4	329 24.8	58.6	274 01.0	04.9
	08	70 48.1	341 22.7	37.4	1 33.3	37.7	344 26.7	58.6	289 03.2	04.8
TUESDAY	09	85 50.6	356 22.1	·· 37.5	16 34.0	·· 37.9	359 28.6	·· 58.6	304 05.3	·· 04.7
	10	100 53.1	11 21.5	37.6	31 34.7	38.2	14 30.6	58.7	319 07.5	04.6
	11	115 55.5	26 20.9	37.8	46 35.4	38.5	29 32.5	58.7	334 09.6	04.5
	12	130 58.0	41 20.4	N21 37.9	61 36.0	N21 38.8	44 34.4	N22 58.7	349 11.8	N16 04.4
	13	146 00.5	56 19.8	38.1	76 36.7	39.0	59 36.4	58.7	4 13.9	04.3
	14	161 02.9	71 19.2	38.2	91 37.4	39.3	74 38.3	58.7	19 16.1	04.2
	15	176 05.4	86 18.6	·· 38.3	106 38.1	·· 39.6	89 40.2	·· 58.7	34 18.2	·· 04.1
	16	191 07.9	101 18.0	38.5	121 38.7	39.8	104 42.1	58.7	49 20.4	04.0
	17	206 10.3	116 17.4	38.6	136 39.4	40.1	119 44.1	58.8	64 22.5	03.9
	18	221 12.8	131 16.8	N21 38.7	151 40.1	N21 40.4	134 46.0	N22 58.8	79 24.7	N16 03.8
	19	236 15.3	146 16.2	38.9	166 40.8	40.6	149 47.9	58.8	94 26.8	03.7
	20	251 17.7	161 15.6	39.0	181 41.4	40.9	164 49.9	58.8	109 29.0	03.6
	21	266 20.2	176 15.0	·· 39.1	196 42.1	·· 41.2	179 51.8	·· 58.8	124 31.1	·· 03.5
	22	281 22.6	191 14.4	39.2	211 42.8	41.4	194 53.7	58.8	139 33.3	03.4
	23	296 25.1	206 13.8	39.4	226 43.5	41.7	209 55.7	58.8	154 35.4	03.3
3	00	311 27.6	221 13.2	N21 39.5	241 44.1	N21 42.0	224 57.6	N22 58.9	169 37.6	N16 03.2
	01	326 30.0	236 12.6	39.6	256 44.8	42.2	239 59.5	58.9	184 39.7	03.1
	02	341 32.5	251 12.0	39.7	271 45.5	42.5	255 01.5	58.9	199 41.9	03.0
	03	356 35.0	266 11.4	·· 39.9	286 46.2	·· 42.8	270 03.4	·· 58.9	214 44.0	·· 02.9
	04	11 37.4	281 10.8	40.0	301 46.8	43.0	285 05.3	58.9	229 46.2	02.8
	05	26 39.9	296 10.3	40.1	316 47.5	43.3	300 07.3	58.9	244 48.3	02.7
	06	41 42.4	311 09.7	N21 40.2	331 48.2	N21 43.6	315 09.2	N22 58.9	259 50.5	N16 02.6
WEDNESDAY	07	56 44.8	326 09.1	40.3	346 48.9	43.8	330 11.1	59.0	274 52.6	02.5
	08	71 47.3	341 08.5	40.5	1 49.5	44.1	345 13.1	59.0	289 54.8	02.4
	09	86 49.8	356 07.9	·· 40.6	16 50.2	·· 44.4	0 15.0	·· 59.0	304 56.9	·· 02.3
	10	101 52.2	11 07.3	40.7	31 50.9	44.6	15 16.9	59.0	319 59.1	02.3
	11	116 54.7	26 06.7	40.8	46 51.6	44.9	30 18.9	59.0	335 01.2	02.2
	12	131 57.1	41 06.1	N21 40.9	61 52.2	N21 45.2	45 20.8	N22 59.0	350 03.4	N16 02.1
	13	146 59.6	56 05.5	41.0	76 52.9	45.4	60 22.7	59.0	5 05.5	02.0
	14	162 02.1	71 04.9	41.1	91 53.6	45.7	75 24.7	59.0	20 07.6	01.9
	15	177 04.5	86 04.3	·· 41.2	106 54.3	·· 45.9	90 26.6	·· 59.1	35 09.8	·· 01.8
	16	192 07.0	101 03.7	41.4	121 54.9	46.2	105 28.5	59.1	50 11.9	01.7
	17	207 09.5	116 03.1	41.5	136 55.6	46.5	120 30.5	59.1	65 14.1	01.6
	18	222 11.9	131 02.5	N21 41.6	151 56.3	N21 46.7	135 32.4	N22 59.1	80 16.2	N16 01.5
	19	237 14.4	146 01.9	41.7	166 57.0	47.0	150 34.3	59.1	95 18.4	01.4
	20	252 16.9	161 01.3	41.8	181 57.7	47.3	165 36.3	59.1	110 20.5	01.3
	21	267 19.3	176 00.6	·· 41.9	196 58.3	·· 47.5	180 38.2	·· 59.1	125 22.7	·· 01.2
	22	282 21.8	191 00.0	42.0	211 59.0	47.8	195 40.1	59.2	140 24.8	01.1
	23	297 24.2	205 59.4	42.1	226 59.7	48.0	210 42.1	59.2	155 27.0	01.0
4	00	312 26.7	220 58.8	N21 42.2	242 00.4	N21 48.3	225 44.0	N22 59.2	170 29.1	N16 00.9
	01	327 29.2	235 58.2	42.3	257 01.0	48.5	240 45.9	59.2	185 31.3	00.8
	02	342 31.6	250 57.6	42.4	272 01.7	48.8	255 47.9	59.2	200 33.4	00.7
	03	357 34.1	265 57.0	·· 42.5	287 02.4	·· 49.1	270 49.8	·· 59.2	215 35.6	·· 00.6
	04	12 36.6	280 56.4	42.6	302 03.1	49.3	285 51.8	59.2	230 37.7	00.5
	05	27 39.0	295 55.8	42.7	317 03.7	49.6	300 53.7	59.2	245 39.9	00.4
	06	42 41.5	310 55.2	N21 42.8	332 04.4	N21 49.8	315 55.6	N22 59.3	260 42.0	N16 00.3
	07	57 44.0	325 54.6	42.9	347 05.1	50.1	330 57.6	59.3	275 44.2	00.2
THURSDAY	08	72 46.4	340 54.0	43.0	2 05.8	50.3	345 59.5	59.3	290 46.3	00.1
	09	87 48.9	355 53.4	·· 43.1	17 06.5	·· 50.6	1 01.4	·· 59.3	305 48.5	16 00.0
	10	102 51.4	10 52.8	43.2	32 07.1	50.9	16 03.4	59.3	320 50.6	15 59.9
	11	117 53.8	25 52.2	43.3	47 07.8	51.1	31 05.3	59.3	335 52.8	59.8
	12	132 56.3	40 51.6	N21 43.4	62 08.5	N21 51.4	46 07.2	N22 59.3	350 54.9	N15 59.7
	13	147 58.7	55 51.0	43.4	77 09.2	51.6	61 09.2	59.3	5 57.1	59.6
	14	163 01.2	70 50.4	43.5	92 09.9	51.9	76 11.1	59.4	20 59.2	59.5
	15	178 03.7	85 49.8	·· 43.6	107 10.5	·· 52.1	91 13.1	·· 59.4	36 01.4	·· 59.4
	16	193 06.1	100 49.1	43.7	122 11.2	52.4	106 15.0	59.4	51 03.5	59.3
	17	208 08.6	115 48.5	43.8	137 11.9	52.6	121 16.9	59.4	66 05.7	59.2
	18	223 11.1	130 47.9	N21 43.9	152 12.6	N21 52.9	136 18.9	N22 59.4	81 07.8	N15 59.1
	19	238 13.5	145 47.3	44.0	167 13.2	53.1	151 20.8	59.4	96 10.0	59.0
	20	253 16.0	160 46.7	44.1	182 13.9	53.4	166 22.7	59.4	111 12.1	58.9
	21	268 18.5	175 46.1	·· 44.1	197 14.6	·· 53.7	181 24.7	·· 59.4	126 14.3	·· 58.8
	22	283 20.9	190 45.5	44.2	212 15.3	53.9	196 26.6	59.5	141 16.4	58.8
	23	298 23.4	205 44.9	44.3	227 16.0	54.2	211 28.6	59.5	156 18.6	58.7
Mer. Pass.		h m 3 13.6	v −0.6	d 0.1	v 0.7	d 0.3	v 1.9	d 0.0	v 2.1	d 0.1

STARS		
Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 38.9	S40 23.4
Achernar	335 46.8	S57 20.7
Acrux	173 39.8	S62 58.7
Adhara	255 34.1	S28 56.5
Aldebaran	291 20.6	N16 27.8
Alioth	166 44.7	N56 05.2
Alkaid	153 20.3	N49 25.8
Al Na'ir	28 17.2	S47 03.9
Alnilam	276 14.0	S 1 13.0
Alphard	218 22.9	S 8 33.7
Alphecca	126 33.8	N26 47.7
Alpheratz	358 11.2	N28 58.0
Altair	62 34.2	N 8 48.7
Ankaa	353 42.1	S42 25.4
Antares	112 59.2	S26 22.9
Arcturus	146 20.4	N19 18.1
Atria	108 25.0	S68 59.4
Avior	234 29.6	S59 26.3
Bellatrix	279 01.2	N 6 19.8
Betelgeuse	271 30.8	N 7 24.2
Canopus	264 08.6	S52 40.9
Capella	281 14.7	N45 58.4
Deneb	49 49.4	N45 12.2
Denebola	183 01.4	N14 41.9
Diphda	349 22.8	S18 06.4
Dubhe	194 25.4	N61 52.5
Elnath	278 47.0	N28 35.2
Eltanin	90 58.3	N51 29.8
Enif	34 13.3	N 9 46.5
Fomalhaut	15 53.4	S29 44.2
Gacrux	172 31.3	S56 59.5
Gienah	176 20.3	S17 25.1
Hadar	149 26.3	S60 16.1
Hamal	328 31.2	N23 21.3
Kaus Aust.	84 19.3	S34 23.7
Kochab	137 19.0	N74 15.2
Markab	14 05.0	N15 05.2
Menkar	314 43.3	N 4 00.2
Menkent	148 39.5	S36 15.7
Miaplacidus	221 46.2	S69 37.6
Mirfak	309 19.1	N49 46.7
Nunki	76 31.4	S26 19.4
Peacock	54 01.1	S56 48.3
Pollux	244 01.1	N28 04.8
Procyon	245 28.3	N 5 16.9
Rasalhague	96 31.3	N12 34.8
Regulus	208 12.5	N12 04.6
Rigel	281 38.2	S 8 13.6
Rigil Kent.	140 28.5	S60 44.7
Sabik	102 43.3	S15 41.7
Schedar	350 11.0	N56 24.7
Shaula	96 58.3	S37 05.3
Sirius	258 57.8	S16 41.1
Spica	158 59.8	S11 02.6
Suhail	223 12.7	S43 20.6
Vega	80 56.9	N38 46.0
Zuben'ubi	137 35.3	S15 56.9

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	269 45.7	9 15
Mars	290 16.6	7 53
Jupiter	273 30.0	8 59
Saturn	218 10.0	12 40

G.M.T.		SUN G.H.A.	SUN Dec.	MOON G.H.A.	v	Dec.	d	H.P.
d h		° ′	° ′	° ′	′	° ′	′	′
2 00		178 26.4	N17 51.0	327 18.4	11.2	S 4 02.6	10.6	57.9
01		193 26.5	50.4	341 48.6	11.3	3 52.0	10.6	57.8
02		208 26.5	49.7	356 18.9	11.4	3 41.4	10.7	57.8
03		223 26.6	·· 49.1	10 49.3	11.4	3 30.7	10.6	57.7
04		238 26.6	48.4	25 19.7	11.4	3 20.1	10.6	57.7
05		253 26.6	47.8	39 50.1	11.5	3 09.5	10.7	57.7
06		268 26.7	N17 47.2	54 20.6	11.6	S 2 58.8	10.6	57.6
07		283 26.7	46.5	68 51.2	11.6	2 48.2	10.6	57.6
08	TUESDAY	298 26.8	45.9	83 21.8	11.7	2 37.6	10.7	57.6
09		313 26.8	·· 45.2	97 52.5	11.7	2 26.9	10.6	57.5
10		328 26.9	44.6	112 23.2	11.7	2 16.3	10.6	57.5
11		343 26.9	44.0	126 53.9	11.8	2 05.7	10.6	57.5
12		358 27.0	N17 43.3	141 24.7	11.9	S 1 55.1	10.7	57.4
13		13 27.0	42.7	155 55.6	11.9	1 44.4	10.6	57.4
14		28 27.0	42.0	170 26.5	11.9	1 33.8	10.6	57.4
15		43 27.1	·· 41.4	184 57.4	12.0	1 23.2	10.6	57.3
16		58 27.1	40.7	199 28.4	12.1	1 12.6	10.6	57.3
17		73 27.2	40.1	213 59.5	12.1	1 02.0	10.6	57.3
18		88 27.2	N17 39.4	228 30.6	12.1	S 0 51.4	10.6	57.2
19		103 27.3	38.8	243 01.7	12.1	0 40.8	10.5	57.2
20		118 27.3	38.1	257 32.8	12.3	0 30.3	10.6	57.2
21		133 27.4	·· 37.5	272 04.1	12.2	0 19.7	10.5	57.1
22		148 27.4	36.9	286 35.3	12.3	S 0 09.2	10.5	57.1
23		163 27.5	36.2	301 06.6	12.3	N 0 01.3	10.6	57.0
3 00		178 27.5	N17 35.6	315 37.9	12.4	N 0 11.9	10.5	57.0
01		193 27.6	34.9	330 09.3	12.4	0 22.4	10.4	57.0
02		208 27.6	34.3	344 40.7	12.4	0 32.8	10.5	56.9
03		223 27.7	·· 33.6	359 12.1	12.5	0 43.3	10.5	56.9
04		238 27.7	33.0	13 43.6	12.5	0 53.8	10.4	56.9
05		253 27.8	32.3	28 15.1	12.6	1 04.2	10.4	56.8
06		268 27.8	N17 31.7	42 46.7	12.6	N 1 14.6	10.4	56.8
07	WEDNESDAY	283 27.9	31.0	57 18.3	12.6	1 25.0	10.4	56.8
08		298 27.9	30.3	71 49.9	12.7	1 35.4	10.3	56.7
09		313 28.0	·· 29.7	86 21.6	12.7	1 45.7	10.4	56.7
10		328 28.0	29.0	100 53.3	12.7	1 56.1	10.3	56.7
11		343 28.1	28.4	115 25.0	12.7	2 06.4	10.3	56.6
12		358 28.1	N17 27.7	129 56.7	12.8	N 2 16.7	10.2	56.6
13		13 28.2	27.1	144 28.5	12.8	2 26.9	10.3	56.6
14		28 28.2	26.4	159 00.3	12.9	2 37.2	10.2	56.5
15		43 28.3	·· 25.8	173 32.2	12.9	2 47.4	10.2	56.5
16		58 28.3	25.1	188 04.1	12.9	2 57.6	10.1	56.5
17		73 28.4	24.4	202 36.0	12.9	3 07.7	10.2	56.4
18		88 28.4	N17 23.8	217 07.9	13.0	N 3 17.9	10.1	56.4
19		103 28.5	23.1	231 39.9	13.0	3 28.0	10.0	56.4
20		118 28.5	22.5	246 11.9	13.0	3 38.0	10.1	56.3
21		133 28.6	·· 21.8	260 43.9	13.0	3 48.1	10.0	56.3
22		148 28.6	21.2	275 15.9	13.1	3 58.1	10.0	56.3
23		163 28.7	20.5	289 48.0	13.1	4 08.1	9.9	56.2
4 00		178 28.8	N17 19.8	304 20.1	13.1	N 4 18.0	10.0	56.2
01		193 28.8	19.2	318 52.2	13.1	4 28.0	9.9	56.2
02		208 28.9	18.5	333 24.3	13.1	4 37.9	9.8	56.2
03		223 28.9	·· 17.8	347 56.4	13.2	4 47.7	9.8	56.1
04		238 29.0	17.2	2 28.6	13.2	4 57.5	9.8	56.1
05		253 29.0	16.5	17 00.8	13.2	5 07.3	9.8	56.1
06		268 29.1	N17 15.9	31 33.0	13.3	N 5 17.1	9.7	56.0
07		283 29.1	15.2	46 05.3	13.2	5 26.8	9.7	56.0
08	THURSDAY	298 29.2	14.5	60 37.5	13.3	5 36.5	9.6	56.0
09		313 29.3	·· 13.9	75 09.8	13.3	5 46.1	9.6	55.9
10		328 29.3	13.2	89 42.1	13.3	5 55.7	9.6	55.9
11		343 29.4	12.5	104 14.4	13.3	6 05.3	9.5	55.9
12		358 29.4	N17 11.9	118 46.7	13.3	N 6 14.8	9.5	55.8
13		13 29.5	11.2	133 19.0	13.4	6 24.3	9.4	55.8
14		28 29.5	10.5	147 51.4	13.3	6 33.7	9.4	55.8
15		43 29.6	·· 09.9	162 23.7	13.4	6 43.1	9.4	55.8
16		58 29.7	09.2	176 56.1	13.4	6 52.5	9.3	55.7
17		73 29.7	08.5	191 28.5	13.4	7 01.8	9.3	55.7
18		88 29.8	N17 07.9	206 00.9	13.4	N 7 11.1	9.2	55.7
19		103 29.8	07.2	220 33.3	13.5	7 20.3	9.2	55.6
20		118 29.9	06.5	235 05.8	13.4	7 29.5	9.2	55.6
21		133 30.0	·· 05.8	249 38.2	13.4	7 38.7	9.1	55.6
22		148 30.0	05.2	264 10.6	13.5	7 47.8	9.1	55.6
23		163 30.1	04.5	278 43.1	13.5	7 56.9	9.0	55.5
		S.D. 15.8	d 0.7	S.D. 15.6		15.4		15.2

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 2	Moonrise 3	Moonrise 4	Moonrise 5
°	h m	h m	h m	h m	h m	h m	h m
N 72	□	□	□	20 57	20 51	20 45	20 39
N 70	////	////	01 41	20 57	20 56	20 56	20 57
68	////	////	02 24	20 56	21 00	21 05	21 11
66	////	00 50	02 52	20 56	21 04	21 12	21 23
64	////	01 50	03 14	20 56	21 07	21 19	21 32
62	////	02 22	03 31	20 55	21 09	21 24	21 41
60	00 46	02 46	03 45	20 55	21 12	21 29	21 48
N 58	01 39	03 04	03 57	20 55	21 14	21 33	21 54
56	02 09	03 19	04 07	20 55	21 16	21 37	22 00
54	02 31	03 32	04 16	20 54	21 17	21 40	22 05
52	02 49	03 44	04 24	20 54	21 19	21 43	22 09
50	03 03	03 53	04 32	20 54	21 20	21 46	22 14
45	03 32	04 14	04 47	20 54	21 23	21 52	22 23
N 40	03 53	04 30	05 00	20 53	21 25	21 57	22 30
35	04 09	04 43	05 11	20 53	21 28	22 02	22 37
30	04 23	04 54	05 20	20 53	21 30	22 06	22 43
20	04 45	05 13	05 36	20 53	21 33	22 13	22 53
N 10	05 02	05 28	05 50	20 52	21 36	22 19	23 01
0	05 16	05 41	06 03	20 52	21 39	22 24	23 10
S 10	05 28	05 53	06 15	20 52	21 42	22 30	23 18
20	05 39	06 06	06 29	20 51	21 45	22 36	23 27
30	05 50	06 19	06 44	20 51	21 48	22 44	23 37
35	05 56	06 26	06 53	20 51	21 50	22 48	23 43
40	06 02	06 34	07 03	20 51	21 53	22 52	23 50
45	06 08	06 43	07 15	20 51	21 55	22 58	23 58
S 50	06 15	06 54	07 29	20 51	21 59	23 04	24 08
52	06 18	06 58	07 35	20 50	22 00	23 07	24 12
54	06 21	07 04	07 43	20 50	22 02	23 11	24 17
56	06 24	07 09	07 51	20 50	22 04	23 14	24 23
58	06 28	07 16	08 00	20 50	22 06	23 18	24 29
S 60	06 32	07 23	08 10	20 50	22 08	23 23	24 36

Lat.	Sunset	Twilight Civil	Twilight Naut.	Moonset 2	Moonset 3	Moonset 4	Moonset 5
°	h m	h m	h m	h m	h m	h m	h m
N 72	□	□	□	07 52	09 37	11 19	13 00
N 70	22 24	////	////	07 56	09 35	11 10	12 44
68	21 44	////	////	07 59	09 33	11 03	12 31
66	21 17	23 10	////	08 02	09 31	10 57	12 21
64	20 56	22 18	////	08 04	09 30	10 52	12 12
62	20 40	21 47	////	08 06	09 28	10 48	12 04
60	20 26	21 24	23 16	08 08	09 27	10 44	11 58
N 58	20 14	21 06	22 29	08 09	09 26	10 41	11 52
56	20 04	20 51	22 00	08 11	09 25	10 38	11 47
54	19 55	20 38	21 39	08 12	09 25	10 35	11 43
52	19 47	20 27	21 22	08 13	09 24	10 32	11 39
50	19 40	20 18	21 08	08 14	09 23	10 30	11 35
45	19 24	19 58	20 40	08 16	09 22	10 25	11 27
N 40	19 12	19 42	20 19	08 18	09 21	10 21	11 20
35	19 01	19 29	20 02	08 19	09 20	10 18	11 15
30	18 52	19 18	19 49	08 21	09 19	10 15	11 10
20	18 36	18 59	19 27	08 23	09 17	10 10	11 01
N 10	18 22	18 44	19 10	08 25	09 16	10 05	10 53
0	18 10	18 31	18 56	08 27	09 15	10 01	10 46
S 10	17 57	18 19	18 44	08 29	09 13	09 56	10 39
20	17 44	18 07	18 33	08 31	09 12	09 52	10 32
30	17 29	17 54	18 22	08 33	09 10	09 47	10 23
35	17 20	17 46	18 17	08 34	09 09	09 44	10 18
40	17 10	17 39	18 11	08 35	09 08	09 40	10 13
45	16 58	17 30	18 05	08 37	09 07	09 36	10 06
S 50	16 44	17 19	17 58	08 39	09 06	09 32	09 58
52	16 38	17 14	17 55	08 40	09 05	09 29	09 55
54	16 30	17 09	17 52	08 41	09 04	09 27	09 51
56	16 22	17 04	17 49	08 42	09 03	09 24	09 46
58	16 13	16 57	17 45	08 43	09 02	09 22	09 42
S 60	16 03	16 50	17 42	08 44	09 01	09 18	09 36

Day	SUN Eqn. of Time 00ʰ	SUN Eqn. of Time 12ʰ	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
	m s	m s	h m	h m	h m	d	
2	06 14	06 12	12 06	02 15	14 40	17	
3	06 10	06 08	12 06	03 03	15 27	18	◑
4	06 05	06 02	12 06	03 50	16 13	19	

1977 AUGUST 5, 6, 7 (FRI., SAT., SUN.)

G.M.T.	ARIES	VENUS −3.5		MARS +1.1		JUPITER −1.6		SATURN +0.6		STARS		
	G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	Name	S.H.A.	Dec.
d h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	° ′
5 00	313 25.9	220 44.3	N21 44.4	242 16.6	N21 54.4	226 30.5	N22 59.5	171 20.7	N15 58.6	Acamar	315 38.9	S40 23.4
01	328 28.3	235 43.7	44.5	257 17.3	54.7	241 32.4	59.5	186 22.9	58.5	Achernar	335 46.7	S57 20.7
02	343 30.8	250 43.0	44.5	272 18.0	54.9	256 34.4	59.5	201 25.0	58.4	Acrux	173 39.8	S62 58.7
03	358 33.2	265 42.4	·· 44.6	287 18.7	·· 55.2	271 36.3	·· 59.5	216 27.2	·· 58.3	Adhara	255 34.1	S28 56.4
04	13 35.7	280 41.8	44.7	302 19.4	55.4	286 38.3	59.5	231 29.3	58.2	Aldebaran	291 20.5	N16 27.8
05	28 38.2	295 41.2	44.8	317 20.0	55.7	301 40.2	59.5	246 31.5	58.1			
06	43 40.6	310 40.6	N21 44.8	332 20.7	N21 55.9	316 42.1	N22 59.6	261 33.6	N15 58.0	Alioth	166 44.7	N56 05.2
07	58 43.1	325 40.0	44.9	347 21.4	56.2	331 44.1	59.6	276 35.7	57.9	Alkaid	153 20.3	N49 25.8
08	73 45.6	340 39.4	45.0	2 22.1	56.4	346 46.0	59.6	291 37.9	57.8	Al Na'ir	28 17.2	S47 04.0
F 09	88 48.0	355 38.8	·· 45.0	17 22.7	·· 56.6	1 48.0	·· 59.6	306 40.0	·· 57.7	Alnilam	276 14.0	S 1 13.0
R 10	103 50.5	10 38.1	45.1	32 23.4	56.9	16 49.9	59.6	321 42.2	57.6	Alphard	218 22.9	S 8 33.7
I 11	118 53.0	25 37.5	45.2	47 24.1	57.1	31 51.8	59.6	336 44.3	57.5			
D 12	133 55.4	40 36.9	N21 45.3	62 24.8	N21 57.4	46 53.8	N22 59.6	351 46.5	N15 57.4	Alphecca	126 33.8	N26 47.7
A 13	148 57.9	55 36.3	45.3	77 25.5	57.6	61 55.7	59.6	6 48.6	57.3	Alpheratz	358 11.2	N28 58.0
Y 14	164 00.3	70 35.7	45.4	92 26.1	57.9	76 57.7	59.7	21 50.8	57.2	Altair	62 34.2	N 8 48.8
15	179 02.8	85 35.1	·· 45.5	107 26.8	·· 58.1	91 59.6	·· 59.7	36 52.9	·· 57.1	Ankaa	353 42.1	S42 25.4
16	194 05.3	100 34.5	45.5	122 27.5	58.4	107 01.5	59.7	51 55.1	57.0	Antares	112 59.2	S26 22.9
17	209 07.7	115 33.8	45.6	137 28.2	58.6	122 03.5	59.7	66 57.2	56.9			
18	224 10.2	130 33.2	N21 45.6	152 28.9	N21 58.9	137 05.4	N22 59.7	81 59.4	N15 56.8	Arcturus	146 20.4	N19 18.2
19	239 12.7	145 32.6	45.7	167 29.5	59.1	152 07.4	59.7	97 01.5	56.7	Atria	108 25.0	S68 59.4
20	254 15.1	160 32.0	45.8	182 30.2	59.4	167 09.3	59.7	112 03.7	56.6	Avior	234 29.6	S59 26.3
21	269 17.6	175 31.4	·· 45.8	197 30.9	·· 59.6	182 11.2	·· 59.7	127 05.8	·· 56.5	Bellatrix	279 01.2	N 6 19.8
22	284 20.1	190 30.8	45.9	212 31.6	21 59.8	197 13.2	59.7	142 08.0	56.4	Betelgeuse	271 30.8	N 7 24.2
23	299 22.5	205 30.1	45.9	227 32.3	22 00.1	212 15.1	59.8	157 10.1	56.3			
6 00	314 25.0	220 29.5	N21 46.0	242 33.0	N22 00.3	227 17.1	N22 59.8	172 12.3	N15 56.2	Canopus	264 08.6	S52 40.9
01	329 27.5	235 28.9	46.0	257 33.6	00.6	242 19.0	59.8	187 14.4	56.1	Capella	281 14.6	N45 58.4
02	344 29.9	250 28.3	46.1	272 34.3	00.8	257 21.0	59.8	202 16.6	56.0	Deneb	49 49.4	N45 12.2
03	359 32.4	265 27.7	·· 46.2	287 35.0	·· 01.1	272 22.9	·· 59.8	217 18.7	·· 55.9	Denebola	183 01.4	N14 41.9
04	14 34.8	280 27.0	46.2	302 35.7	01.3	287 24.8	59.8	232 20.9	55.8	Diphda	349 22.8	S18 06.4
05	29 37.3	295 26.4	46.3	317 36.4	01.5	302 26.8	59.8	247 23.0	55.7			
06	44 39.8	310 25.8	N21 46.3	332 37.0	N22 01.8	317 28.7	N22 59.8	262 25.2	N15 55.6	Dubhe	194 25.4	N61 52.5
07	59 42.2	325 25.2	46.4	347 37.7	02.0	332 30.7	59.9	277 27.3	55.5	Elnath	278 47.0	N28 35.2
S 08	74 44.7	340 24.6	46.4	2 38.4	02.3	347 32.6	59.9	292 29.5	55.4	Eltanin	90 58.3	N51 29.8
A 09	89 47.2	355 23.9	·· 46.5	17 39.1	·· 02.5	2 34.6	·· 59.9	307 31.6	·· 55.3	Enif	34 13.3	N 9 46.5
T 10	104 49.6	10 23.3	46.5	32 39.8	02.7	17 36.5	59.9	322 33.8	55.2	Fomalhaut	15 53.4	S29 44.2
U 11	119 52.1	25 22.7	46.5	47 40.4	03.0	32 38.4	59.9	337 35.9	55.1			
R 12	134 54.6	40 22.1	N21 46.6	62 41.1	N22 03.2	47 40.4	N22 59.9	352 38.1	N15 55.0	Gacrux	172 31.3	S56 59.5
D 13	149 57.0	55 21.5	46.6	77 41.8	03.5	62 42.3	59.9	7 40.2	54.9	Gienah	176 20.3	S17 25.1
A 14	164 59.5	70 20.8	46.7	92 42.5	03.7	77 44.3	59.9	22 42.4	54.8	Hadar	149 26.3	S60 16.1
Y 15	180 02.0	85 20.2	·· 46.7	107 43.2	·· 03.9	92 46.2	22 59.9	37 44.5	·· 54.8	Hamal	328 31.2	N23 21.3
16	195 04.4	100 19.6	46.8	122 43.9	04.2	107 48.2	23 00.0	52 46.6	54.7	Kaus Aust.	84 19.3	S34 23.7
17	210 06.9	115 19.0	46.8	137 44.5	04.4	122 50.1	00.0	67 48.8	54.6			
18	225 09.3	130 18.4	N21 46.8	152 45.2	N22 04.6	137 52.1	N23 00.0	82 50.9	N15 54.5	Kochab	137 19.0	N74 15.2
19	240 11.8	145 17.7	46.9	167 45.9	04.9	152 54.0	00.0	97 53.1	54.4	Markab	14 04.9	N15 05.2
20	255 14.3	160 17.1	46.9	182 46.6	05.1	167 56.0	00.0	112 55.2	54.3	Menkar	314 43.3	N 4 00.2
21	270 16.7	175 16.5	·· 47.0	197 47.3	·· 05.3	182 57.9	·· 00.0	127 57.4	·· 54.2	Menkent	148 39.5	S36 15.7
22	285 19.2	190 15.9	47.0	212 47.9	05.6	197 59.8	00.0	142 59.5	54.1	Miaplacidus	221 46.2	S69 37.6
23	300 21.7	205 15.2	47.0	227 48.6	05.8	213 01.8	00.0	158 01.7	54.0			
7 00	315 24.1	220 14.6	N21 47.1	242 49.3	N22 06.1	228 03.7	N23 00.0	173 03.8	N15 53.9	Mirfak	309 19.1	N49 46.7
01	330 26.6	235 14.0	47.1	257 50.0	06.3	243 05.7	00.1	188 06.0	53.8	Nunki	76 31.4	S26 19.4
02	345 29.1	250 13.4	47.1	272 50.7	06.5	258 07.6	00.1	203 08.1	53.7	Peacock	54 01.1	S56 48.3
03	0 31.5	265 12.7	·· 47.1	287 51.4	·· 06.8	273 09.6	·· 00.1	218 10.3	·· 53.6	Pollux	244 01.1	N28 04.8
04	15 34.0	280 12.1	47.2	302 52.0	07.0	288 11.5	00.1	233 12.4	53.5	Procyon	245 28.3	N 5 16.9
05	30 36.4	295 11.5	47.2	317 52.7	07.2	303 13.5	00.1	248 14.6	53.4			
06	45 38.9	310 10.9	N21 47.2	332 53.4	N22 07.5	318 15.4	N23 00.1	263 16.7	N15 53.3	Rasalhague	96 31.3	N12 34.8
07	60 41.4	325 10.2	47.3	347 54.1	07.7	333 17.4	00.1	278 18.9	53.2	Regulus	208 12.5	N12 04.6
08	75 43.8	340 09.6	47.3	2 54.8	07.9	348 19.3	00.1	293 21.0	53.1	Rigel	281 38.2	S 8 13.6
S 09	90 46.3	355 09.0	·· 47.3	17 55.5	·· 08.2	3 21.3	·· 00.1	308 23.2	·· 53.0	Rigil Kent.	140 28.6	S60 44.7
U 10	105 48.8	10 08.4	47.3	32 56.1	08.4	18 23.2	00.1	323 25.3	52.9	Sabik	102 43.3	S15 41.7
N 11	120 51.2	25 07.7	47.3	47 56.8	08.6	33 25.1	00.2	338 27.5	52.8			
D 12	135 53.7	40 07.1	N21 47.4	62 57.5	N22 08.8	48 27.1	N23 00.2	353 29.6	N15 52.7	Schedar	350 11.0	N56 24.7
A 13	150 56.2	55 06.5	47.4	77 58.2	09.1	63 29.0	00.2	8 31.8	52.6	Shaula	96 58.3	S37 05.3
Y 14	165 58.6	70 05.9	47.4	92 58.9	09.3	78 31.0	00.2	23 33.9	52.5	Sirius	258 57.8	S16 41.1
15	181 01.1	85 05.2	·· 47.4	107 59.6	·· 09.5	93 32.9	·· 00.2	38 36.1	·· 52.4	Spica	158 59.8	S11 02.6
16	196 03.6	100 04.6	47.4	123 00.2	09.8	108 34.9	00.2	53 38.2	52.3	Suhail	223 12.7	S43 20.6
17	211 06.0	115 04.0	47.5	138 00.9	10.0	123 36.8	00.2	68 40.4	52.2			
18	226 08.5	130 03.3	N21 47.5	153 01.6	N22 10.2	138 38.8	N23 00.2	83 42.5	N15 52.1	Vega	80 56.9	N38 46.1
19	241 10.9	145 02.7	47.5	168 02.3	10.5	153 40.7	00.2	98 44.6	52.0	Zuben'ubi	137 35.3	S15 56.9
20	256 13.4	160 02.1	47.5	183 03.0	10.7	168 42.7	00.3	113 46.8	51.9		S.H.A.	Mer. Pass.
21	271 15.9	175 01.5	·· 47.5	198 03.7	·· 10.9	183 44.6	·· 00.3	128 48.9	·· 51.8		° ′	h m
22	286 18.3	190 00.8	47.5	213 04.4	11.1	198 46.6	00.3	143 51.1	51.7	Venus	266 04.5	9 18
23	301 20.8	205 00.2	47.5	228 05.0	11.4	213 48.5	00.3	158 53.2	51.6	Mars	288 08.0	7 49
										Jupiter	272 52.1	8 50
Mer. Pass.	h m 3 01.8	v −0.6	d 0.0	v 0.7	d 0.2	v 1.9	d 0.0	v 2.1	d 0.1	Saturn	217 47.3	12 29

	G.M.T.	SUN G.H.A.	SUN Dec.	MOON G.H.A.	*v*	MOON Dec.	*d*	H.P.
	d h	° ′	° ′	° ′	′	° ′	′	′
	5 00	178 30.1	N17 03.8	293 15.6	13.4	N 8 05.9	8.9	55.5
	01	193 30.2	03.2	307 48.0	13.5	8 14.8	9.0	55.5
	02	208 30.3	02.5	322 20.5	13.5	8 23.8	8.8	55.5
	03	223 30.3	·· 01.8	336 53.0	13.5	8 32.6	8.9	55.4
	04	238 30.4	01.1	351 25.5	13.5	8 41.5	8.8	55.4
	05	253 30.4	17 00.5	5 58.0	13.5	8 50.3	8.7	55.4
	06	268 30.5	N16 59.8	20 30.5	13.5	N 8 59.0	8.7	55.4
	07	283 30.6	59.1	35 03.0	13.5	9 07.7	8.6	55.3
	08	298 30.6	58.4	49 35.5	13.6	9 16.3	8.6	55.3
F	09	313 30.7	·· 57.8	64 08.1	13.5	9 24.9	8.5	55.3
R	10	328 30.8	57.1	78 40.6	13.5	9 33.4	8.5	55.3
I	11	343 30.8	56.4	93 13.1	13.6	9 41.9	8.5	55.2
D	12	358 30.9	N16 55.7	107 45.7	13.5	N 9 50.4	8.3	55.2
A	13	13 30.9	55.0	122 18.2	13.5	9 58.7	8.4	55.2
Y	14	28 31.0	54.4	136 50.7	13.5	10 07.1	8.3	55.2
	15	43 31.1	·· 53.7	151 23.2	13.6	10 15.4	8.2	55.1
	16	58 31.1	53.0	165 55.8	13.5	10 23.6	8.2	55.1
	17	73 31.2	52.3	180 28.3	13.6	10 31.8	8.1	55.1
	18	88 31.3	N16 51.6	195 00.9	13.5	N10 39.9	8.0	55.1
	19	103 31.3	51.0	209 33.4	13.5	10 47.9	8.0	55.0
	20	118 31.4	50.3	224 05.9	13.5	10 55.9	8.0	55.0
	21	133 31.5	·· 49.6	238 38.4	13.6	11 03.9	7.9	55.0
	22	148 31.5	48.9	253 11.0	13.5	11 11.8	7.8	55.0
	23	163 31.6	48.2	267 43.5	13.5	11 19.6	7.8	55.0
	6 00	178 31.7	N16 47.5	282 16.0	13.5	N11 27.4	7.7	54.9
	01	193 31.7	46.9	296 48.5	13.5	11 35.1	7.7	54.9
	02	208 31.8	46.2	311 21.0	13.5	11 42.8	7.6	54.9
	03	223 31.9	·· 45.5	325 53.5	13.5	11 50.4	7.6	54.9
	04	238 31.9	44.8	340 26.0	13.5	11 58.0	7.5	54.9
	05	253 32.0	44.1	354 58.5	13.5	12 05.5	7.4	54.8
	06	268 32.1	N16 43.4	9 31.0	13.5	N12 12.9	7.4	54.8
	07	283 32.1	42.7	24 03.5	13.5	12 20.3	7.3	54.8
S	08	298 32.2	42.1	38 36.0	13.5	12 27.6	7.3	54.8
A	09	313 32.3	·· 41.4	53 08.5	13.4	12 34.9	7.2	54.8
T	10	328 32.3	40.7	67 40.9	13.5	12 42.1	7.1	54.7
U	11	343 32.4	40.0	82 13.4	13.4	12 49.2	7.1	54.7
R	12	358 32.5	N16 39.3	96 45.8	13.4	N12 56.3	7.0	54.7
D	13	13 32.6	38.6	111 18.2	13.5	13 03.3	6.9	54.7
A	14	28 32.6	37.9	125 50.7	13.4	13 10.2	6.9	54.7
Y	15	43 32.7	·· 37.2	140 23.1	13.4	13 17.1	6.9	54.7
	16	58 32.8	36.5	154 55.5	13.4	13 24.0	6.7	54.6
	17	73 32.8	35.8	169 27.9	13.4	13 30.7	6.7	54.6
	18	88 32.9	N16 35.2	184 00.3	13.4	N13 37.4	6.7	54.6
	19	103 33.0	34.5	198 32.7	13.3	13 44.1	6.5	54.6
	20	118 33.1	33.8	213 05.0	13.4	13 50.6	6.5	54.6
	21	133 33.1	·· 33.1	227 37.4	13.3	13 57.1	6.5	54.6
	22	148 33.2	32.4	242 09.7	13.3	14 03.6	6.3	54.5
	23	163 33.3	31.7	256 42.0	13.4	14 09.9	6.3	54.5
	7 00	178 33.3	N16 31.0	271 14.4	13.3	N14 16.2	6.3	54.5
	01	193 33.4	30.3	285 46.7	13.3	14 22.5	6.2	54.5
	02	208 33.5	29.6	300 19.0	13.2	14 28.7	6.1	54.5
	03	223 33.6	·· 28.9	314 51.2	13.3	14 34.8	6.0	54.5
	04	238 33.6	28.2	329 23.5	13.3	14 40.8	6.0	54.5
	05	253 33.7	27.5	343 55.8	13.2	14 46.8	5.9	54.5
	06	268 33.8	N16 26.8	358 28.0	13.2	N14 52.7	5.8	54.4
	07	283 33.9	26.1	13 00.2	13.2	14 58.5	5.8	54.4
	08	298 33.9	25.4	27 32.4	13.2	15 04.3	5.7	54.4
S	09	313 34.0	·· 24.7	42 04.6	13.2	15 10.0	5.6	54.4
U	10	328 34.1	24.0	56 36.8	13.2	15 15.6	5.6	54.4
N	11	343 34.2	23.3	71 09.0	13.1	15 21.2	5.5	54.4
D	12	358 34.2	N16 22.6	85 41.1	13.1	N15 26.7	5.4	54.4
A	13	13 34.3	21.9	100 13.2	13.1	15 32.1	5.3	54.4
Y	14	28 34.4	21.2	114 45.3	13.1	15 37.4	5.3	54.4
	15	43 34.5	·· 20.5	129 17.4	13.1	15 42.7	5.2	54.3
	16	58 34.5	19.8	143 49.5	13.1	15 47.9	5.1	54.3
	17	73 34.6	19.1	158 21.6	13.1	15 53.0	5.1	54.3
	18	88 34.7	N16 18.4	172 53.7	13.0	N15 58.1	5.0	54.3
	19	103 34.8	17.7	187 25.7	13.0	16 03.1	4.9	54.3
	20	118 34.8	17.0	201 57.7	13.0	16 08.0	4.8	54.3
	21	133 34.9	·· 16.3	216 29.7	13.0	16 12.8	4.8	54.3
	22	148 35.0	15.6	231 01.7	13.0	16 17.6	4.7	54.3
	23	163 35.1	14.9	245 33.7	12.9	16 22.3	4.6	54.3
		S.D. 15.8	*d* 0.7	S.D. 15.0		14.9		14.8

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 5	Moonrise 6	Moonrise 7	Moonrise 8
°	h m	h m	h m	h m	h m	h m	h m
N 72	////	////	00 55	20 39	20 32	20 23	20 05
N 70	////	////	02 03	20 57	20 59	21 04	21 15
68	////	////	02 39	21 11	21 19	21 32	21 52
66	////	01 22	03 04	21 23	21 35	21 53	22 18
64	////	02 06	03 23	21 32	21 49	22 10	22 38
62	////	02 34	03 39	21 41	22 00	22 24	22 55
60	01 14	02 55	03 52	21 48	22 10	22 36	23 08
N 58	01 53	03 12	04 03	21 54	22 18	22 46	23 20
56	02 19	03 26	04 13	22 00	22 25	22 55	23 30
54	02 39	03 38	04 21	22 05	22 32	23 03	23 39
52	02 56	03 49	04 29	22 09	22 38	23 10	23 47
50	03 09	03 58	04 36	22 14	22 43	23 17	23 55
45	03 36	04 18	04 51	22 23	22 55	23 31	24 10
N 40	03 56	04 33	05 03	22 30	23 05	23 42	24 23
35	04 12	04 45	05 13	22 37	23 13	23 52	24 34
30	04 25	04 56	05 22	22 43	23 21	24 01	00 01
20	04 46	05 14	05 37	22 53	23 33	24 16	00 16
N 10	05 02	05 28	05 50	23 01	23 45	24 29	00 29
0	05 16	05 41	06 02	23 10	23 55	24 41	00 41
S 10	05 27	05 53	06 14	23 18	24 06	00 06	00 54
20	05 38	06 04	06 27	23 27	24 17	00 17	01 07
30	05 48	06 17	06 42	23 37	24 30	00 30	01 22
35	05 53	06 24	06 50	23 43	24 38	00 38	01 31
40	05 59	06 31	07 00	23 50	24 47	00 47	01 41
45	06 04	06 39	07 11	23 58	24 57	00 57	01 53
S 50	06 11	06 49	07 24	24 08	00 08	01 09	02 08
52	06 13	06 54	07 30	24 12	00 12	01 15	02 14
54	06 16	06 58	07 37	24 17	00 17	01 21	02 22
56	06 19	07 04	07 45	24 23	00 23	01 28	02 30
58	06 22	07 10	07 53	24 29	00 29	01 36	02 40
S 60	06 26	07 16	08 03	24 36	00 36	01 45	02 51

Lat.	Sunset	Twilight Civil	Twilight Naut.	Moonset 5	Moonset 6	Moonset 7	Moonset 8
°	h m	h m	h m	h m	h m	h m	h m
N 72	23 03	////	////	13 00	14 42	16 26	18 21
N 70	22 03	////	////	12 44	14 16	15 46	17 12
68	21 29	////	////	12 31	13 57	15 19	16 35
66	21 05	22 43	////	12 21	13 41	14 58	16 09
64	20 46	22 02	////	12 12	13 29	14 42	15 49
62	20 31	21 35	////	12 04	13 18	14 28	15 33
60	20 18	21 14	22 51	11 58	13 09	14 17	15 20
N 58	20 07	20 58	22 15	11 52	13 01	14 07	15 08
56	19 57	20 44	21 49	11 47	12 54	13 58	14 58
54	19 49	20 32	21 30	11 43	12 48	13 50	14 49
52	19 41	20 21	21 14	11 39	12 42	13 44	14 41
50	19 35	20 12	21 01	11 35	12 37	13 37	14 34
45	19 20	19 53	20 34	11 27	12 27	13 24	14 19
N 40	19 08	19 38	20 15	11 20	12 18	13 13	14 07
35	18 58	19 26	19 59	11 15	12 10	13 04	13 56
30	18 49	19 15	19 46	11 10	12 03	12 55	13 47
20	18 34	18 58	19 25	11 01	11 51	12 41	13 31
N 10	18 21	18 43	19 09	10 53	11 41	12 29	13 17
0	18 09	18 31	18 56	10 46	11 32	12 17	13 04
S 10	17 57	18 19	18 44	10 39	11 22	12 06	12 51
20	17 45	18 08	18 34	10 32	11 12	11 54	12 37
30	17 30	17 55	18 24	10 23	11 00	11 40	12 21
35	17 22	17 49	18 19	10 18	10 54	11 31	12 12
40	17 13	17 41	18 13	10 13	10 46	11 22	12 01
45	17 02	17 33	18 08	10 06	10 37	11 11	11 49
S 50	16 48	17 23	18 02	09 58	10 27	10 58	11 34
52	16 42	17 19	17 59	09 55	10 22	10 52	11 27
54	16 35	17 14	17 56	09 51	10 17	10 46	11 19
56	16 28	17 09	17 54	09 46	10 11	10 38	11 10
58	16 19	17 03	17 50	09 42	10 04	10 30	11 01
S 60	16 09	16 56	17 47	09 36	09 56	10 20	10 49

Day	SUN Eqn. of Time 00ʰ	SUN Eqn. of Time 12ʰ	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
	m s	m s	h m	h m	h m	d	
5	06 00	05 57	12 06	04 35	16 58	20	◑
6	05 53	05 50	12 06	05 21	17 43	21	
7	05 47	05 43	12 06	06 06	18 29	22	

1977 AUGUST 8, 9, 10 (MON., TUES., WED.)

G.M.T.		ARIES	VENUS −3.5		MARS +1.1		JUPITER −1.6		SATURN +0.6	
		G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
d	h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
8	00	316 23.3	219 59.6	N21 47.5	243 05.7	N22 11.6	228 50.5	N23 00.3	173 55.4	N15 51.5
	01	331 25.7	234 58.9	47.6	258 06.4	11.8	243 52.4	00.3	188 57.5	51.4
	02	346 28.2	249 58.3	47.6	273 07.1	12.0	258 54.4	00.3	203 59.7	51.3
	03	1 30.7	264 57.7	·· 47.6	288 07.8	·· 12.3	273 56.3	·· 00.3	219 01.8	·· 51.2
	04	16 33.1	279 57.0	47.6	303 08.5	12.5	288 58.3	00.3	234 04.0	51.1
	05	31 35.6	294 56.4	47.6	318 09.1	12.7	304 00.2	00.3	249 06.1	51.0
	06	46 38.1	309 55.8	N21 47.6	333 09.8	N22 12.9	319 02.2	N23 00.4	264 08.3	N15 50.9
	07	61 40.5	324 55.2	47.6	348 10.5	13.2	334 04.1	00.4	279 10.4	50.8
	08	76 43.0	339 54.5	47.6	3 11.2	13.4	349 06.1	00.4	294 12.6	50.7
M	09	91 45.4	354 53.9	·· 47.6	18 11.9	·· 13.6	4 08.0	·· 00.4	309 14.7	·· 50.6
O	10	106 47.9	9 53.3	47.6	33 12.6	13.8	19 10.0	00.4	324 16.9	50.5
N	11	121 50.4	24 52.6	47.6	48 13.3	14.1	34 11.9	00.4	339 19.0	50.4
D	12	136 52.8	39 52.0	N21 47.6	63 13.9	N22 14.3	49 13.9	N23 00.4	354 21.2	N15 50.3
A	13	151 55.3	54 51.4	47.6	78 14.6	14.5	64 15.8	00.4	9 23.3	50.2
Y	14	166 57.8	69 50.7	47.6	93 15.3	14.7	79 17.8	00.4	24 25.5	50.1
	15	182 00.2	84 50.1	·· 47.6	108 16.0	·· 15.0	94 19.7	·· 00.4	39 27.6	·· 50.0
	16	197 02.7	99 49.5	47.6	123 16.7	15.2	109 21.7	00.5	54 29.8	50.0
	17	212 05.2	114 48.8	47.6	138 17.4	15.4	124 23.6	00.5	69 31.9	49.9
	18	227 07.6	129 48.2	N21 47.5	153 18.1	N22 15.6	139 25.6	N23 00.5	84 34.1	N15 49.8
	19	242 10.1	144 47.6	47.5	168 18.8	15.8	154 27.5	00.5	99 36.2	49.7
	20	257 12.5	159 46.9	47.5	183 19.4	16.1	169 29.5	00.5	114 38.3	49.6
	21	272 15.0	174 46.3	·· 47.5	198 20.1	·· 16.3	184 31.5	·· 00.5	129 40.5	·· 49.5
	22	287 17.5	189 45.7	47.5	213 20.8	16.5	199 33.4	00.5	144 42.6	49.4
	23	302 19.9	204 45.0	47.5	228 21.5	16.7	214 35.4	00.5	159 44.8	49.3
9	00	317 22.4	219 44.4	N21 47.5	243 22.2	N22 16.9	229 37.3	N23 00.5	174 46.9	N15 49.2
	01	332 24.9	234 43.8	47.5	258 22.9	17.2	244 39.3	00.5	189 49.1	49.1
	02	347 27.3	249 43.1	47.4	273 23.6	17.4	259 41.2	00.5	204 51.2	49.0
	03	2 29.8	264 42.5	·· 47.4	288 24.2	·· 17.6	274 43.2	·· 00.6	219 53.4	·· 48.9
	04	17 32.3	279 41.8	47.4	303 24.9	17.8	289 45.1	00.6	234 55.5	48.8
	05	32 34.7	294 41.2	47.4	318 25.6	18.0	304 47.1	00.6	249 57.7	48.7
	06	47 37.2	309 40.6	N21 47.4	333 26.3	N22 18.2	319 49.0	N23 00.6	264 59.8	N15 48.6
	07	62 39.7	324 39.9	47.3	348 27.0	18.5	334 51.0	00.6	280 02.0	48.5
T	08	77 42.1	339 39.3	47.3	3 27.7	18.7	349 52.9	00.6	295 04.1	48.4
U	09	92 44.6	354 38.7	·· 47.3	18 28.4	·· 18.9	4 54.9	·· 00.6	310 06.3	·· 48.3
E	10	107 47.0	9 38.0	47.3	33 29.1	19.1	19 56.9	00.6	325 08.4	48.2
S	11	122 49.5	24 37.4	47.3	48 29.8	19.3	34 58.8	00.6	340 10.6	48.1
D	12	137 52.0	39 36.8	N21 47.2	63 30.4	N22 19.5	50 00.8	N23 00.6	355 12.7	N15 48.0
A	13	152 54.4	54 36.1	47.2	78 31.1	19.7	65 02.7	00.6	10 14.9	47.9
Y	14	167 56.9	69 35.5	47.2	93 31.8	20.0	80 04.7	00.7	25 17.0	47.8
	15	182 59.4	84 34.8	·· 47.1	108 32.5	·· 20.2	95 06.6	·· 00.7	40 19.2	·· 47.7
	16	198 01.8	99 34.2	47.1	123 33.2	20.4	110 08.6	00.7	55 21.3	47.6
	17	213 04.3	114 33.6	47.1	138 33.9	20.6	125 10.5	00.7	70 23.5	47.5
	18	228 06.8	129 32.9	N21 47.0	153 34.6	N22 20.8	140 12.5	N23 00.7	85 25.6	N15 47.4
	19	243 09.2	144 32.3	47.0	168 35.3	21.0	155 14.5	00.7	100 27.7	47.3
	20	258 11.7	159 31.6	47.0	183 36.0	21.2	170 16.4	00.7	115 29.9	47.2
	21	273 14.2	174 31.0	·· 46.9	198 36.6	·· 21.4	185 18.4	·· 00.7	130 32.0	·· 47.1
	22	288 16.6	189 30.4	46.9	213 37.3	21.7	200 20.3	00.7	145 34.2	47.0
	23	303 19.1	204 29.7	46.9	228 38.0	21.9	215 22.3	00.7	160 36.3	46.9
10	00	318 21.5	219 29.1	N21 46.8	243 38.7	N22 22.1	230 24.2	N23 00.7	175 38.5	N15 46.8
	01	333 24.0	234 28.4	46.8	258 39.4	22.3	245 26.2	00.8	190 40.6	46.7
	02	348 26.5	249 27.8	46.8	273 40.1	22.5	260 28.2	00.8	205 42.8	46.6
	03	3 28.9	264 27.2	·· 46.7	288 40.8	·· 22.7	275 30.1	·· 00.8	220 44.9	·· 46.5
	04	18 31.4	279 26.5	46.7	303 41.5	22.9	290 32.1	00.8	235 47.1	46.4
	05	33 33.9	294 25.9	46.6	318 42.2	23.1	305 34.0	00.8	250 49.2	46.3
	06	48 36.3	309 25.2	N21 46.6	333 42.8	N22 23.3	320 36.0	N23 00.8	265 51.4	N15 46.2
W	07	63 38.8	324 24.6	46.5	348 43.5	23.5	335 37.9	00.8	280 53.5	46.1
E	08	78 41.3	339 24.0	46.5	3 44.2	23.8	350 39.9	00.8	295 55.7	46.0
D	09	93 43.7	354 23.3	·· 46.4	18 44.9	·· 24.0	5 41.9	·· 00.8	310 57.8	·· 45.9
N	10	108 46.2	9 22.7	46.4	33 45.6	24.2	20 43.8	00.8	326 00.0	45.8
E	11	123 48.6	24 22.0	46.3	48 46.3	24.4	35 45.8	00.8	341 02.1	45.7
S	12	138 51.1	39 21.4	N21 46.3	63 47.0	N22 24.6	50 47.7	N23 00.8	356 04.3	N15 45.6
D	13	153 53.6	54 20.8	46.2	78 47.7	24.8	65 49.7	00.9	11 06.4	45.5
A	14	168 56.0	69 20.1	46.2	93 48.4	25.0	80 51.7	00.9	26 08.6	45.4
Y	15	183 58.5	84 19.5	·· 46.1	108 49.1	·· 25.2	95 53.6	·· 00.9	41 10.7	·· 45.3
	16	199 01.0	99 18.8	46.1	123 49.8	25.4	110 55.6	00.9	56 12.9	45.2
	17	214 03.4	114 18.2	46.0	138 50.4	25.6	125 57.5	00.9	71 15.0	45.1
	18	229 05.9	129 17.5	N21 46.0	153 51.1	N22 25.8	140 59.5	N23 00.9	86 17.2	N15 45.0
	19	244 08.4	144 16.9	45.9	168 51.8	26.0	156 01.5	00.9	101 19.3	44.9
	20	259 10.8	159 16.3	45.9	183 52.5	26.2	171 03.4	00.9	116 21.4	44.8
	21	274 13.3	174 15.6	·· 45.8	198 53.2	·· 26.4	186 05.4	·· 00.9	131 23.6	·· 44.7
	22	289 15.8	189 15.0	45.7	213 53.9	26.6	201 07.3	00.9	146 25.7	44.6
	23	304 18.2	204 14.3	45.7	228 54.6	26.8	216 09.3	00.9	161 27.9	44.5
Mer. Pass.		h m 2 50.0	*v* −0.6	*d* 0.0	*v* 0.7	*d* 0.2	*v* 2.0	*d* 0.0	*v* 2.1	*d* 0.1

STARS		
Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 38.8	S40 23.4
Achernar	335 46.7	S57 20.7
Acrux	173 39.9	S62 58.7
Adhara	255 34.1	S28 56.4
Aldebaran	291 20.5	N16 27.8
Alioth	166 44.7	N56 05.1
Alkaid	153 20.4	N49 25.8
Al Na'ir	28 17.1	S47 04.0
Alnilam	276 14.0	S 1 12.9
Alphard	218 22.9	S 8 33.7
Alphecca	126 33.8	N26 47.7
Alpheratz	358 11.2	N28 58.0
Altair	62 34.2	N 8 48.8
Ankaa	353 42.1	S42 25.4
Antares	112 59.3	S26 22.9
Arcturus	146 20.4	N19 18.2
Atria	108 25.0	S68 59.4
Avior	234 29.6	S59 26.3
Bellatrix	279 01.2	N 6 19.8
Betelgeuse	271 30.7	N 7 24.2
Canopus	264 08.5	S52 40.9
Capella	281 14.6	N45 58.3
Deneb	49 49.4	N45 12.2
Denebola	183 01.4	N14 41.9
Diphda	349 22.8	S18 06.4
Dubhe	194 25.4	N61 52.4
Elnath	278 47.0	N28 35.2
Eltanin	90 58.3	N51 29.9
Enif	34 13.3	N 9 46.5
Fomalhaut	15 53.4	S29 44.2
Gacrux	172 31.3	S56 59.5
Gienah	176 20.3	S17 25.1
Hadar	149 26.3	S60 16.1
Hamal	328 31.2	N23 21.4
Kaus Aust.	84 19.3	S34 23.7
Kochab	137 19.1	N74 15.2
Markab	14 04.9	N15 05.2
Menkar	314 43.3	N 4 00.2
Menkent	148 39.5	S36 15.7
Miaplacidus	221 46.2	S69 37.6
Mirfak	309 19.1	N49 46.7
Nunki	76 31.4	S26 19.4
Peacock	54 01.1	S56 48.3
Pollux	244 01.1	N28 04.8
Procyon	245 28.3	N 5 16.9
Rasalhague	96 31.3	N12 34.8
Regulus	208 12.5	N12 04.6
Rigel	281 38.2	S 8 13.6
Rigil Kent.	140 28.6	S60 44.7
Sabik	102 43.3	S15 41.7
Schedar	350 10.9	N56 24.7
Shaula	96 58.3	S37 05.3
Sirius	258 57.8	S16 41.1
Spica	158 59.8	S11 02.6
Suhail	223 12.7	S43 20.6
Vega	80 56.9	N38 46.1
Zuben'ubi	137 35.3	S15 56.9

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	262 22.0	9 21
Mars	285 59.8	7 46
Jupiter	272 14.9	8 40
Saturn	217 24.5	12 19

G.M.T.		SUN		MOON				
		G.H.A.	Dec.	G.H.A.	*v*	Dec.	*d*	H.P.
d	h	° ′	° ′	° ′	′	° ′	′	′
8	00	178 35.2	N16 14.2	260 05.6	12.9	N16 26.9	4.6	54.3
	01	193 35.2	13.5	274 37.5	12.9	16 31.5	4.4	54.3
	02	208 35.3	12.8	289 09.4	12.9	16 35.9	4.4	54.3
	03	223 35.4	·· 12.1	303 41.3	12.9	16 40.3	4.3	54.2
	04	238 35.5	11.3	318 13.2	12.9	16 44.6	4.3	54.2
	05	253 35.6	10.6	332 45.1	12.8	16 48.9	4.2	54.2
	06	268 35.6	N16 09.9	347 16.9	12.9	N16 53.1	4.0	54.2
	07	283 35.7	09.2	1 48.8	12.8	16 57.1	4.1	54.2
	08	298 35.8	08.5	16 20.6	12.8	17 01.2	3.9	54.2
M	09	313 35.9	·· 07.8	30 52.4	12.7	17 05.1	3.9	54.2
O	10	328 36.0	07.1	45 24.1	12.8	17 09.0	3.7	54.2
N	11	343 36.0	06.4	59 55.9	12.7	17 12.7	3.7	54.2
D	12	358 36.1	N16 05.7	74 27.6	12.7	N17 16.4	3.7	54.2
A	13	13 36.2	05.0	88 59.3	12.7	17 20.1	3.5	54.2
Y	14	28 36.3	04.2	103 31.0	12.7	17 23.6	3.5	54.2
	15	43 36.4	·· 03.5	118 02.7	12.7	17 27.1	3.4	54.2
	16	58 36.5	02.8	132 34.4	12.6	17 30.5	3.3	54.2
	17	73 36.5	02.1	147 06.0	12.6	17 33.8	3.2	54.2
	18	88 36.6	N16 01.4	161 37.6	12.6	N17 37.0	3.2	54.2
	19	103 36.7	00.7	176 09.2	12.6	17 40.2	3.0	54.2
	20	118 36.8	16 00.0	190 40.8	12.6	17 43.2	3.0	54.2
	21	133 36.9	15 59.2	205 12.4	12.6	17 46.2	3.0	54.2
	22	148 37.0	58.5	219 44.0	12.5	17 49.2	2.8	54.2
	23	163 37.0	57.8	234 15.5	12.5	17 52.0	2.7	54.2
9	00	178 37.1	N15 57.1	248 47.0	12.5	N17 54.7	2.7	54.2
	01	193 37.2	56.4	263 18.5	12.5	17 57.4	2.6	54.2
	02	208 37.3	55.7	277 50.0	12.5	18 00.0	2.5	54.2
	03	223 37.4	·· 54.9	292 21.5	12.4	18 02.5	2.4	54.2
	04	238 37.5	54.2	306 52.9	12.4	18 04.9	2.4	54.2
	05	253 37.5	53.5	321 24.3	12.5	18 07.3	2.2	54.2
	06	268 37.6	N15 52.8	335 55.8	12.4	N18 09.5	2.2	54.2
	07	283 37.7	52.1	350 27.2	12.3	18 11.7	2.1	54.2
T	08	298 37.8	51.3	4 58.5	12.4	18 13.8	2.0	54.2
U	09	313 37.9	·· 50.6	19 29.9	12.3	18 15.8	1.9	54.2
E	10	328 38.0	49.9	34 01.2	12.4	18 17.7	1.9	54.2
S	11	343 38.1	49.2	48 32.6	12.3	18 19.6	1.7	54.2
D	12	358 38.2	N15 48.5	63 03.9	12.3	N18 21.3	1.7	54.2
A	13	13 38.2	47.7	77 35.2	12.2	18 23.0	1.6	54.2
Y	14	28 38.3	47.0	92 06.4	12.3	18 24.6	1.5	54.2
	15	43 38.4	·· 46.3	106 37.7	12.3	18 26.1	1.4	54.2
	16	58 38.5	45.6	121 09.0	12.2	18 27.5	1.4	54.2
	17	73 38.6	44.8	135 40.2	12.2	18 28.9	1.2	54.2
	18	88 38.7	N15 44.1	150 11.4	12.2	N18 30.1	1.2	54.2
	19	103 38.8	43.4	164 42.6	12.2	18 31.3	1.1	54.2
	20	118 38.9	42.7	179 13.8	12.2	18 32.4	1.0	54.2
	21	133 39.0	·· 41.9	193 45.0	12.1	18 33.4	0.9	54.2
	22	148 39.0	41.2	208 16.1	12.2	18 34.3	0.8	54.3
	23	163 39.1	40.5	222 47.3	12.1	18 35.1	0.8	54.3
10	00	178 39.2	N15 39.8	237 18.4	12.1	N18 35.9	0.6	54.3
	01	193 39.3	39.0	251 49.5	12.1	18 36.5	0.6	54.3
	02	208 39.4	38.3	266 20.6	12.1	18 37.1	0.5	54.3
	03	223 39.5	·· 37.6	280 51.7	12.0	18 37.6	0.4	54.3
	04	238 39.6	36.8	295 22.7	12.1	18 38.0	0.3	54.3
	05	253 39.7	36.1	309 53.8	12.0	18 38.3	0.2	54.3
	06	268 39.8	N15 35.4	324 24.8	12.1	N18 38.5	0.1	54.3
W	07	283 39.9	34.7	338 55.9	12.0	18 38.6	0.1	54.3
E	08	298 40.0	33.9	353 26.9	12.0	18 38.7	0.1	54.3
D	09	313 40.1	·· 33.2	7 57.9	12.0	18 38.6	0.1	54.3
N	10	328 40.1	32.5	22 28.9	12.0	18 38.5	0.2	54.3
E	11	343 40.2	31.7	36 59.9	11.9	18 38.3	0.3	54.4
S	12	358 40.3	N15 31.0	51 30.8	12.0	N18 38.0	0.4	54.4
D	13	13 40.4	30.3	66 01.8	11.9	18 37.6	0.4	54.4
A	14	28 40.5	29.5	80 32.7	12.0	18 37.2	0.6	54.4
Y	15	43 40.6	·· 28.8	95 03.7	11.9	18 36.6	0.7	54.4
	16	58 40.7	28.1	109 34.6	11.9	18 35.9	0.7	54.4
	17	73 40.8	27.3	124 05.5	11.9	18 35.2	0.8	54.4
	18	88 40.9	N15 26.6	138 36.4	11.9	N18 34.4	0.9	54.4
	19	103 41.0	25.9	153 07.3	11.9	18 33.5	1.0	54.4
	20	118 41.1	25.1	167 38.2	11.9	18 32.5	1.1	54.4
	21	133 41.2	·· 24.4	182 09.1	11.9	18 31.4	1.2	54.5
	22	148 41.3	23.6	196 40.0	11.8	18 30.2	1.2	54.5
	23	163 41.4	22.9	211 10.8	11.9	18 29.0	1.4	54.5
		S.D. 15.8	*d* 0.7	S.D. 14.8		14.8		14.8

Lat.	Twilight		Sunrise	Moonrise			
	Naut.	Civil		8	9	10	11
°	h m	h m	h m	h m	h m	h m	h m
N 72	////	////	01 33	20 05	▭	▭	22 39
N 70	////	////	02 22	21 15	21 40	22 30	23 46
68	////	00 22	02 52	21 52	22 24	23 14	24 22
66	////	01 44	03 15	22 18	22 54	23 44	24 47
64	////	02 20	03 33	22 38	23 16	24 06	00 06
62	00 20	02 45	03 47	22 55	23 34	24 24	00 24
60	01 34	03 04	03 59	23 08	23 49	24 38	00 38
N 58	02 06	03 20	04 10	23 20	24 01	00 01	00 51
56	02 29	03 33	04 19	23 30	24 12	00 12	01 02
54	02 48	03 45	04 27	23 39	24 22	00 22	01 11
52	03 03	03 54	04 34	23 47	24 30	00 30	01 20
50	03 15	04 03	04 40	23 55	24 38	00 38	01 27
45	03 41	04 21	04 54	24 10	00 10	00 54	01 43
N 40	04 00	04 36	05 06	24 23	00 23	01 08	01 57
35	04 15	04 48	05 15	24 34	00 34	01 19	02 08
30	04 28	04 58	05 24	00 01	00 44	01 29	02 18
20	04 48	05 15	05 38	00 16	01 00	01 46	02 35
N 10	05 03	05 29	05 50	00 29	01 15	02 01	02 50
0	05 16	05 41	06 02	00 41	01 28	02 16	03 04
S 10	05 27	05 52	06 13	00 54	01 42	02 30	03 17
20	05 36	06 03	06 26	01 07	01 56	02 45	03 32
30	05 46	06 14	06 39	01 22	02 13	03 02	03 49
35	05 51	06 21	06 47	01 31	02 23	03 12	03 59
40	05 56	06 28	06 56	01 41	02 34	03 24	04 11
45	06 01	06 36	07 06	01 53	02 47	03 37	04 24
S 50	06 06	06 45	07 19	02 08	03 03	03 54	04 40
52	06 08	06 49	07 25	02 14	03 10	04 01	04 48
54	06 11	06 53	07 31	02 22	03 19	04 10	04 56
56	06 14	06 58	07 38	02 30	03 28	04 20	05 06
58	06 16	07 03	07 46	02 40	03 39	04 31	05 16
S 60	06 19	07 09	07 55	02 51	03 51	04 44	05 29

Lat.	Sunset	Twilight		Moonset			
		Civil	Naut.	8	9	10	11
°	h m	h m	h m	h m	h m	h m	h m
N 72	22 29	////	////	18 21	▭	▭	20 46
N 70	21 44	////	////	17 12	18 25	19 14	19 39
68	21 15	23 24	////	16 35	17 40	18 30	19 02
66	20 53	22 21	////	16 09	17 11	18 00	18 36
64	20 36	21 47	////	15 49	16 49	17 38	18 16
62	20 22	21 23	23 29	15 33	16 31	17 20	18 00
60	20 10	21 04	22 32	15 20	16 16	17 05	17 46
N 58	20 00	20 49	22 01	15 08	16 04	16 53	17 34
56	19 51	20 36	21 39	14 58	15 53	16 42	17 24
54	19 43	20 25	21 21	14 49	15 43	16 32	17 15
52	19 36	20 15	21 07	14 41	15 35	16 24	17 07
50	19 30	20 07	20 54	14 34	15 27	16 16	17 00
45	19 16	19 49	20 29	14 19	15 11	16 00	16 44
N 40	19 05	19 34	20 10	14 07	14 58	15 46	16 32
35	18 55	19 22	19 55	13 56	14 47	15 35	16 21
30	18 47	19 12	19 43	13 47	14 37	15 25	16 11
20	18 33	18 56	19 23	13 31	14 20	15 08	15 55
N 10	18 20	18 42	19 08	13 17	14 05	14 53	15 40
0	18 09	18 30	18 55	13 04	13 51	14 39	15 27
S 10	17 58	18 19	18 44	12 51	13 37	14 25	15 13
20	17 46	18 08	18 35	12 37	13 22	14 10	14 59
30	17 32	17 57	18 25	12 21	13 05	13 52	14 42
35	17 24	17 51	18 21	12 12	12 55	13 42	14 33
40	17 15	17 44	18 16	12 01	12 44	13 31	14 21
45	17 05	17 36	18 11	11 49	12 31	13 17	14 08
S 50	16 53	17 27	18 05	11 34	12 14	13 01	13 52
52	16 47	17 23	18 03	11 27	12 07	12 53	13 45
54	16 40	17 19	18 01	11 19	11 58	12 44	13 37
56	16 33	17 14	17 58	11 10	11 49	12 34	13 27
58	16 25	17 08	17 55	11 01	11 38	12 23	13 17
S 60	16 16	17 02	17 53	10 49	11 26	12 10	13 04

Day	SUN			MOON			
	Eqn. of Time		Mer. Pass.	Mer. Pass.		Age	Phase
	00ʰ	12ʰ		Upper	Lower		
	m s	m s	h m	h m	h m	d	
8	05 40	05 36	12 06	06 53	19 16	23	◑
9	05 32	05 28	12 05	07 39	20 03	24	
10	05 23	05 19	12 05	08 27	20 51	25	

1977 AUGUST 11, 12, 13 (THURS., FRI., SAT.)

G.M.T.		ARIES	VENUS −3.5		MARS +1.1		JUPITER −1.6		SATURN +0.6	
		G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
d	h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
11	00	319 20.7	219 13.7	N21 45.6	243 55.3	N22 27.0	231 11.3	N23 00.9	176 30.0	N15 44.4
	01	334 23.1	234 13.0	45.6	258 56.0	27.2	246 13.2	00.9	191 32.2	44.3
	02	349 25.6	249 12.4	45.5	273 56.7	27.4	261 15.2	01.0	206 34.3	44.2
	03	4 28.1	264 11.7	· · 45.4	288 57.4	· · 27.6	276 17.1	· · 01.0	221 36.5	· · 44.1
	04	19 30.5	279 11.1	45.4	303 58.1	27.8	291 19.1	01.0	236 38.6	44.1
	05	34 33.0	294 10.5	45.3	318 58.8	28.1	306 21.1	01.0	251 40.8	44.0
	06	49 35.5	309 09.8	N21 45.2	333 59.4	N22 28.3	321 23.0	N23 01.0	266 42.9	N15 43.9
	07	64 37.9	324 09.2	45.2	349 00.1	28.5	336 25.0	01.0	281 45.1	43.8
T	08	79 40.4	339 08.5	45.1	4 00.8	28.7	351 27.0	01.0	296 47.2	43.7
H	09	94 42.9	354 07.9	· · 45.0	19 01.5	· · 28.9	6 28.9	· · 01.0	311 49.4	· · 43.6
U	10	109 45.3	9 07.2	44.9	34 02.2	29.1	21 30.9	01.0	326 51.5	43.5
R	11	124 47.8	24 06.6	44.9	49 02.9	29.3	36 32.8	01.0	341 53.7	43.4
S	12	139 50.3	39 05.9	N21 44.8	64 03.6	N22 29.4	51 34.8	N23 01.0	356 55.8	N15 43.3
D	13	154 52.7	54 05.3	44.7	79 04.3	29.6	66 36.8	01.0	11 58.0	43.2
A	14	169 55.2	69 04.6	44.6	94 05.0	29.8	81 38.7	01.0	27 00.1	43.1
Y	15	184 57.6	84 04.0	· · 44.6	109 05.7	· · 30.0	96 40.7	· · 01.1	42 02.3	· · 43.0
	16	200 00.1	99 03.3	44.5	124 06.4	30.2	111 42.7	01.1	57 04.4	42.9
	17	215 02.6	114 02.7	44.4	139 07.1	30.4	126 44.6	01.1	72 06.6	42.8
	18	230 05.0	129 02.1	N21 44.3	154 07.8	N22 30.6	141 46.6	N23 01.1	87 08.7	N15 42.7
	19	245 07.5	144 01.4	44.2	169 08.5	30.8	156 48.5	01.1	102 10.8	42.6
	20	260 10.0	159 00.8	44.2	184 09.2	31.0	171 50.5	01.1	117 13.0	42.5
	21	275 12.4	174 00.1	· · 44.1	199 09.9	· · 31.2	186 52.5	· · 01.1	132 15.1	· · 42.4
	22	290 14.9	188 59.5	44.0	214 10.5	31.4	201 54.4	01.1	147 17.3	42.3
	23	305 17.4	203 58.8	43.9	229 11.2	31.6	216 56.4	01.1	162 19.4	42.2
12	00	320 19.8	218 58.2	N21 43.8	244 11.9	N22 31.8	231 58.4	N23 01.1	177 21.6	N15 42.1
	01	335 22.3	233 57.5	43.7	259 12.6	32.0	247 00.3	01.1	192 23.7	42.0
	02	350 24.7	248 56.9	43.6	274 13.3	32.2	262 02.3	01.1	207 25.9	41.9
	03	5 27.2	263 56.2	· · 43.6	289 14.0	· · 32.4	277 04.3	· · 01.1	222 28.0	· · 41.8
	04	20 29.7	278 55.6	43.5	304 14.7	32.6	292 06.2	01.2	237 30.2	41.7
	05	35 32.1	293 54.9	43.4	319 15.4	32.8	307 08.2	01.2	252 32.3	41.6
	06	50 34.6	308 54.3	N21 43.3	334 16.1	N22 33.0	322 10.2	N23 01.2	267 34.5	N15 41.5
	07	65 37.1	323 53.6	43.2	349 16.8	33.2	337 12.1	01.2	282 36.6	41.4
	08	80 39.5	338 53.0	43.1	4 17.5	33.4	352 14.1	01.2	297 38.8	41.3
F	09	95 42.0	353 52.3	· · 43.0	19 18.2	· · 33.5	7 16.1	· · 01.2	312 40.9	· · 41.2
R	10	110 44.5	8 51.7	42.9	34 18.9	33.7	22 18.0	01.2	327 43.1	41.1
I	11	125 46.9	23 51.0	42.8	49 19.6	33.9	37 20.0	01.2	342 45.2	41.0
D	12	140 49.4	38 50.4	N21 42.7	64 20.3	N22 34.1	52 22.0	N23 01.2	357 47.4	N15 40.9
A	13	155 51.9	53 49.7	42.6	79 21.0	34.3	67 23.9	01.2	12 49.5	40.8
Y	14	170 54.3	68 49.1	42.5	94 21.7	34.5	82 25.9	01.2	27 51.7	40.7
	15	185 56.8	83 48.4	· · 42.4	109 22.4	· · 34.7	97 27.9	· · 01.2	42 53.8	· · 40.6
	16	200 59.2	98 47.8	42.3	124 23.1	34.9	112 29.8	01.2	57 56.0	40.5
	17	216 01.7	113 47.1	42.2	139 23.8	35.1	127 31.8	01.2	72 58.1	40.4
	18	231 04.2	128 46.5	N21 42.1	154 24.5	N22 35.3	142 33.8	N23 01.2	88 00.2	N15 40.3
	19	246 06.6	143 45.8	42.0	169 25.2	35.4	157 35.7	01.3	103 02.4	40.2
	20	261 09.1	158 45.2	41.9	184 25.9	35.6	172 37.7	01.3	118 04.5	40.1
	21	276 11.6	173 44.5	· · 41.8	199 26.6	· · 35.8	187 39.7	· · 01.3	133 06.7	· · 40.0
	22	291 14.0	188 43.9	41.7	214 27.3	36.0	202 41.6	01.3	148 08.8	39.9
	23	306 16.5	203 43.2	41.6	229 27.9	36.2	217 43.6	01.3	163 11.0	39.8
13	00	321 19.0	218 42.6	N21 41.4	244 28.6	N22 36.4	232 45.6	N23 01.3	178 13.1	N15 39.7
	01	336 21.4	233 41.9	41.3	259 29.3	36.6	247 47.5	01.3	193 15.3	39.6
	02	351 23.9	248 41.3	41.2	274 30.0	36.8	262 49.5	01.3	208 17.4	39.5
	03	6 26.4	263 40.6	· · 41.1	289 30.7	· · 36.9	277 51.5	· · 01.3	223 19.6	· · 39.4
	04	21 28.8	278 40.0	41.0	304 31.4	37.1	292 53.5	01.3	238 21.7	39.3
	05	36 31.3	293 39.3	40.9	319 32.1	37.3	307 55.4	01.3	253 23.9	39.2
	06	51 33.7	308 38.7	N21 40.8	334 32.8	N22 37.5	322 57.4	N23 01.3	268 26.0	N15 39.1
	07	66 36.2	323 38.0	40.6	349 33.5	37.7	337 59.4	01.3	283 28.2	39.0
S	08	81 38.7	338 37.4	40.5	4 34.2	37.9	353 01.3	01.3	298 30.3	38.9
A	09	96 41.1	353 36.7	· · 40.4	19 34.9	· · 38.1	8 03.3	· · 01.3	313 32.5	· · 38.8
T	10	111 43.6	8 36.1	40.3	34 35.6	38.2	23 05.3	01.4	328 34.6	38.7
U	11	126 46.1	23 35.4	40.2	49 36.3	38.4	38 07.2	01.4	343 36.8	38.6
R	12	141 48.5	38 34.8	N21 40.0	64 37.0	N22 38.6	53 09.2	N23 01.4	358 38.9	N15 38.5
D	13	156 51.0	53 34.1	39.9	79 37.7	38.8	68 11.2	01.4	13 41.1	38.4
A	14	171 53.5	68 33.5	39.8	94 38.4	39.0	83 13.2	01.4	28 43.2	38.3
Y	15	186 55.9	83 32.8	· · 39.7	109 39.1	· · 39.2	98 15.1	· · 01.4	43 45.4	· · 38.2
	16	201 58.4	98 32.2	39.5	124 39.8	39.3	113 17.1	01.4	58 47.5	38.1
	17	217 00.8	113 31.5	39.4	139 40.5	39.5	128 19.1	01.4	73 49.7	38.0
	18	232 03.3	128 30.8	N21 39.3	154 41.2	N22 39.7	143 21.0	N23 01.4	88 51.8	N15 37.9
	19	247 05.8	143 30.2	39.2	169 41.9	39.9	158 23.0	01.4	103 53.9	37.8
	20	262 08.2	158 29.5	39.0	184 42.6	40.1	173 25.0	01.4	118 56.1	37.7
	21	277 10.7	173 28.9	· · 38.9	199 43.3	· · 40.2	188 27.0	· · 01.4	133 58.2	· · 37.6
	22	292 13.2	188 28.2	38.8	214 44.0	40.4	203 28.9	01.4	149 00.4	37.5
	23	307 15.6	203 27.6	38.6	229 44.7	40.6	218 30.9	01.4	164 02.5	37.4
Mer. Pass.		h m 2 38.2	v −0.6	d 0.1	v 0.7	d 0.2	v 2.0	d 0.0	v 2.1	d 0.1

STARS		
Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 38.8	S40 23.4
Achernar	335 46.7	S57 20.7
Acrux	173 39.9	S62 58.7
Adhara	255 34.0	S28 56.4
Aldebaran	291 20.5	N16 27.8
Alioth	166 44.7	N56 05.1
Alkaid	153 20.4	N49 25.8
Al Na'ir	28 17.1	S47 04.0
Alnilam	276 14.0	S 1 12.9
Alphard	218 22.9	S 8 33.7
Alphecca	126 33.8	N26 47.7
Alpheratz	358 11.2	N28 58.0
Altair	62 34.2	N 8 48.8
Ankaa	353 42.0	S42 25.4
Antares	112 59.3	S26 22.9
Arcturus	146 20.4	N19 18.2
Atria	108 25.1	S68 59.4
Avior	234 29.6	S59 26.3
Bellatrix	279 01.1	N 6 19.8
Betelgeuse	271 30.7	N 7 24.2
Canopus	264 08.5	S52 40.9
Capella	281 14.6	N45 58.3
Deneb	49 49.4	N45 12.2
Denebola	183 01.4	N14 41.9
Diphda	349 22.8	S18 06.4
Dubhe	194 25.4	N61 52.4
Elnath	278 46.9	N28 35.2
Eltanin	90 58.3	N51 29.9
Enif	34 13.3	N 9 46.5
Fomalhaut	15 53.4	S29 44.2
Gacrux	172 31.3	S56 59.5
Gienah	176 20.3	S17 25.1
Hadar	149 26.4	S60 16.1
Hamal	328 31.1	N23 21.4
Kaus Aust.	84 19.3	S34 23.7
Kochab	137 19.2	N74 15.2
Markab	14 04.9	N15 05.2
Menkar	314 43.3	N 4 00.2
Menkent	148 39.5	S36 15.7
Miaplacidus	221 46.2	S69 37.6
Mirfak	309 19.0	N49 46.7
Nunki	76 31.4	S26 19.4
Peacock	54 01.1	S56 48.3
Pollux	244 01.0	N28 04.8
Procyon	245 28.2	N 5 16.9
Rasalhague	96 31.3	N12 34.8
Regulus	208 12.5	N12 04.6
Rigel	281 38.2	S 8 13.6
Rigil Kent.	140 28.6	S60 44.7
Sabik	102 43.3	S15 41.7
Schedar	350 10.9	N56 24.8
Shaula	96 58.3	S37 05.3
Sirius	258 57.8	S16 41.1
Spica	158 59.9	S11 02.6
Suhail	223 12.7	S43 20.6
Vega	80 56.9	N38 46.1
Zuben'ubi	137 35.3	S15 56.9

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	258 38.4	9 25
Mars	283 52.1	7 43
Jupiter	271 38.5	8 31
Saturn	217 01.8	12 09

G.M.T.		SUN G.H.A.	SUN Dec.	MOON G.H.A.	v	MOON Dec.	d	H.P.
	d h	° ′	° ′	° ′	′	° ′	′	′
	11 00	178 41.5	N15 22.2	225 41.7	11.8	N18 27.6	1.4	54.5
	01	193 41.6	21.4	240 12.5	11.8	18 26.2	1.6	54.5
	02	208 41.7	20.7	254 43.3	11.9	18 24.6	1.6	54.5
	03	223 41.8	·· 20.0	269 14.2	11.8	18 23.0	1.7	54.5
	04	238 41.9	19.2	283 45.0	11.8	18 21.3	1.8	54.5
	05	253 42.0	18.5	298 15.8	11.8	18 19.5	1.8	54.6
	06	268 42.1	N15 17.7	312 46.6	11.8	N18 17.7	2.0	54.6
	07	283 42.2	17.0	327 17.4	11.8	18 15.7	2.0	54.6
T	08	298 42.3	16.3	341 48.2	11.8	18 13.7	2.2	54.6
H	09	313 42.4	·· 15.5	356 19.0	11.8	18 11.5	2.2	54.6
U	10	328 42.5	14.8	10 49.8	11.8	18 09.3	2.3	54.6
R	11	343 42.6	14.0	25 20.6	11.7	18 07.0	2.4	54.6
S	12	358 42.7	N15 13.3	39 51.3	11.8	N18 04.6	2.5	54.7
D	13	13 42.7	12.5	54 22.1	11.8	18 02.1	2.6	54.7
A	14	28 42.8	11.8	68 52.9	11.7	17 59.5	2.7	54.7
Y	15	43 42.9	·· 11.1	83 23.6	11.8	17 56.8	2.7	54.7
	16	58 43.1	10.3	97 54.4	11.7	17 54.1	2.8	54.7
	17	73 43.2	09.6	112 25.1	11.8	17 51.3	3.0	54.7
	18	88 43.3	N15 08.8	126 55.9	11.7	N17 48.3	3.0	54.7
	19	103 43.4	08.1	141 26.6	11.8	17 45.3	3.1	54.8
	20	118 43.5	07.3	155 57.4	11.7	17 42.2	3.2	54.8
	21	133 43.6	·· 06.6	170 28.1	11.8	17 39.0	3.2	54.8
	22	148 43.7	05.8	184 58.9	11.7	17 35.8	3.4	54.8
	23	163 43.8	05.1	199 29.6	11.7	17 32.4	3.4	54.8
	12 00	178 43.9	N15 04.3	214 00.3	11.8	N17 29.0	3.6	54.8
	01	193 44.0	03.6	228 31.1	11.7	17 25.4	3.6	54.9
	02	208 44.1	02.8	243 01.8	11.7	17 21.8	3.7	54.9
	03	223 44.2	·· 02.1	257 32.5	11.8	17 18.1	3.8	54.9
	04	238 44.3	01.3	272 03.3	11.7	17 14.3	3.8	54.9
	05	253 44.4	15 00.6	286 34.0	11.7	17 10.5	4.0	54.9
	06	268 44.5	N14 59.8	301 04.7	11.8	N17 06.5	4.0	54.9
	07	283 44.6	59.1	315 35.5	11.7	17 02.5	4.2	55.0
	08	298 44.7	58.3	330 06.2	11.7	16 58.3	4.2	55.0
F	09	313 44.8	·· 57.6	344 36.9	11.8	16 54.1	4.3	55.0
R	10	328 44.9	56.8	359 07.7	11.7	16 49.8	4.3	55.0
I	11	343 45.0	56.1	13 38.4	11.8	16 45.5	4.5	55.0
D	12	358 45.1	N14 55.3	28 09.2	11.7	N16 41.0	4.5	55.0
A	13	13 45.2	54.6	42 39.9	11.7	16 36.5	4.7	55.1
Y	14	28 45.3	53.8	57 10.6	11.8	16 31.8	4.7	55.1
	15	43 45.4	·· 53.1	71 41.4	11.7	16 27.1	4.8	55.1
	16	58 45.5	52.3	86 12.1	11.8	16 22.3	4.9	55.1
	17	73 45.6	51.6	100 42.9	11.7	16 17.4	4.9	55.1
	18	88 45.7	N14 50.8	115 13.6	11.8	N16 12.5	5.1	55.2
	19	103 45.9	50.0	129 44.4	11.7	16 07.4	5.1	55.2
	20	118 46.0	49.3	144 15.1	11.8	16 02.3	5.2	55.2
	21	133 46.1	·· 48.5	158 45.9	11.8	15 57.1	5.3	55.2
	22	148 46.2	47.8	173 16.7	11.7	15 51.8	5.3	55.2
	23	163 46.3	47.0	187 47.4	11.8	15 46.5	5.5	55.3
	13 00	178 46.4	N14 46.3	202 18.2	11.8	N15 41.0	5.5	55.3
	01	193 46.5	45.5	216 49.0	11.8	15 35.5	5.6	55.3
	02	208 46.6	44.7	231 19.8	11.8	15 29.9	5.7	55.3
	03	223 46.7	·· 44.0	245 50.6	11.7	15 24.2	5.7	55.3
	04	238 46.8	43.2	260 21.3	11.8	15 18.5	5.9	55.4
	05	253 46.9	42.5	274 52.1	11.8	15 12.6	5.9	55.4
	06	268 47.0	N14 41.7	289 22.9	11.8	N15 06.7	6.0	55.4
	07	283 47.2	40.9	303 53.7	11.8	15 00.7	6.1	55.4
S	08	298 47.3	40.2	318 24.5	11.9	14 54.6	6.1	55.4
A	09	313 47.4	·· 39.4	332 55.4	11.8	14 48.5	6.3	55.5
T	10	328 47.5	38.7	347 26.2	11.8	14 42.2	6.3	55.5
U	11	343 47.6	37.9	1 57.0	11.8	14 35.9	6.3	55.5
R	12	358 47.7	N14 37.1	16 27.8	11.9	N14 29.6	6.5	55.5
D	13	13 47.8	36.4	30 58.7	11.8	14 23.1	6.5	55.5
A	14	28 47.9	35.6	45 29.5	11.8	14 16.6	6.6	55.6
Y	15	43 48.0	·· 34.8	60 00.3	11.9	14 10.0	6.7	55.6
	16	58 48.1	34.1	74 31.2	11.9	14 03.3	6.8	55.6
	17	73 48.3	33.3	89 02.1	11.8	13 56.5	6.8	55.6
	18	88 48.4	N14 32.5	103 32.9	11.9	N13 49.7	6.9	55.6
	19	103 48.5	31.8	118 03.8	11.9	13 42.8	6.9	55.7
	20	118 48.6	31.0	132 34.7	11.8	13 35.9	7.1	55.7
	21	133 48.7	·· 30.3	147 05.5	11.9	13 28.8	7.1	55.7
	22	148 48.8	29.5	161 36.4	11.9	13 21.7	7.2	55.7
	23	163 48.9	28.7	176 07.3	11.9	13 14.5	7.2	55.7
		S.D. 15.8	d 0.8	S.D. 14.9		15.0		15.1

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 11	Moonrise 12	Moonrise 13	Moonrise 14
°	h m	h m	h m	h m	h m	h m	h m
N 72	////	////	02 00	22 39	24 37	00 37	02 26
N 70	////	////	02 39	23 46	25 15	01 15	02 51
68	////	01 14	03 06	24 22	00 22	01 42	03 09
66	////	02 03	03 26	24 47	00 47	02 02	03 24
64	////	02 33	03 42	00 06	01 07	02 18	03 36
62	01 06	02 56	03 55	00 24	01 23	02 32	03 46
60	01 50	03 13	04 06	00 38	01 37	02 43	03 55
N 58	02 18	03 28	04 16	00 51	01 48	02 53	04 02
56	02 39	03 40	04 25	01 02	01 58	03 01	04 09
54	02 55	03 51	04 32	01 11	02 07	03 09	04 15
52	03 09	04 00	04 39	01 20	02 15	03 15	04 20
50	03 21	04 08	04 45	01 27	02 22	03 22	04 25
45	03 45	04 25	04 58	01 43	02 37	03 35	04 36
N 40	04 03	04 39	05 08	01 57	02 49	03 45	04 44
35	04 18	04 50	05 17	02 08	03 00	03 55	04 52
30	04 30	05 00	05 25	02 18	03 09	04 03	04 58
20	04 49	05 16	05 39	02 35	03 25	04 17	05 09
N 10	05 03	05 29	05 51	02 50	03 39	04 29	05 19
0	05 15	05 40	06 02	03 04	03 52	04 40	05 29
S 10	05 26	05 51	06 12	03 17	04 05	04 52	05 38
20	05 35	06 01	06 24	03 32	04 19	05 04	05 48
30	05 44	06 12	06 37	03 49	04 35	05 18	05 59
35	05 48	06 18	06 44	03 59	04 44	05 26	06 05
40	05 52	06 24	06 52	04 11	04 54	05 35	06 12
45	05 57	06 31	07 02	04 24	05 07	05 45	06 21
S 50	06 01	06 40	07 14	04 40	05 21	05 58	06 31
52	06 03	06 43	07 19	04 48	05 28	06 04	06 36
54	06 06	06 48	07 25	04 56	05 36	06 11	06 41
56	06 08	06 52	07 32	05 06	05 45	06 18	06 47
58	06 10	06 57	07 39	05 16	05 55	06 26	06 53
S 60	06 13	07 02	07 48	05 29	06 06	06 36	07 00

Lat.	Sunset	Twilight Civil	Twilight Naut.	Moonset 11	Moonset 12	Moonset 13	Moonset 14
°	h m	h m	h m	h m	h m	h m	h m
N 72	22 03	////	////	20 46	20 29	20 20	20 13
N 70	21 26	////	////	19 39	19 50	19 55	19 57
68	21 01	22 46	////	19 02	19 22	19 35	19 44
66	20 41	22 02	////	18 36	19 02	19 20	19 33
64	20 26	21 33	////	18 16	18 45	19 07	19 24
62	20 13	21 12	22 55	18 00	18 31	18 56	19 16
60	20 02	20 54	22 15	17 46	18 19	18 47	19 09
N 58	19 52	20 40	21 49	17 34	18 09	18 38	19 03
56	19 44	20 28	21 29	17 24	18 00	18 31	18 58
54	19 37	20 18	21 12	17 15	17 52	18 25	18 53
52	19 30	20 09	20 59	17 07	17 45	18 19	18 49
50	19 24	20 01	20 47	17 00	17 39	18 14	18 45
45	19 11	19 44	20 24	16 44	17 25	18 02	18 36
N 40	19 01	19 30	20 06	16 32	17 14	17 53	18 29
35	18 52	19 19	19 51	16 21	17 04	17 45	18 23
30	18 44	19 09	19 40	16 11	16 55	17 37	18 17
20	18 31	18 54	19 21	15 55	16 41	17 25	18 08
N 10	18 19	18 41	19 06	15 40	16 28	17 14	18 00
0	18 08	18 30	18 55	15 27	16 15	17 04	17 52
S 10	17 58	18 19	18 44	15 13	16 03	16 53	17 44
20	17 46	18 09	18 35	14 59	15 50	16 42	17 35
30	17 34	17 58	18 27	14 42	15 35	16 29	17 25
35	17 26	17 53	18 23	14 33	15 26	16 22	17 20
40	17 18	17 46	18 18	14 21	15 16	16 13	17 13
45	17 08	17 39	18 14	14 08	15 04	16 03	17 06
S 50	16 57	17 31	18 09	13 52	14 50	15 51	16 56
52	16 51	17 27	18 07	13 45	14 43	15 46	16 52
54	16 46	17 23	18 05	13 37	14 36	15 40	16 48
56	16 39	17 19	18 03	13 27	14 27	15 33	16 42
58	16 32	17 14	18 01	13 17	14 18	15 25	16 37
S 60	16 23	17 09	17 58	13 04	14 07	15 16	16 30

Day	SUN Eqn. of Time 00ʰ	SUN Eqn. of Time 12ʰ	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
	m s	m s	h m	h m	h m	d	
11	05 14	05 10	12 05	09 15	21 39	26	
12	05 05	05 00	12 05	10 04	22 28	27	●
13	04 55	04 49	12 05	10 52	23 16	28	

G.M.T.		ARIES	VENUS −3.5		MARS +1.1		JUPITER −1.7		SATURN +0.6		STARS		
d	h	G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	Name	S.H.A.	Dec.
		° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	° ′
14	00	322 18.1	218 26.9	N21 38.5	244 45.4	N22 40.8	233 32.9	N23 01.4	179 04.7	N15 37.3	Acamar	315 38.8	S40 23.4
	01	337 20.6	233 26.3	38.4	259 46.1	41.0	248 34.9	01.4	194 06.8	37.2	Achernar	335 46.6	S57 20.7
	02	352 23.0	248 25.6	38.2	274 46.8	41.1	263 36.8	01.5	209 09.0	37.1	Acrux	173 39.9	S62 58.7
	03	7 25.5	263 25.0	·· 38.1	289 47.5	·· 41.3	278 38.8	·· 01.5	224 11.1	·· 37.0	Adhara	255 34.0	S28 56.4
	04	22 28.0	278 24.3	37.9	304 48.2	41.5	293 40.8	01.5	239 13.3	36.9	Aldebaran	291 20.5	N16 27.8
	05	37 30.4	293 23.7	37.8	319 48.9	41.7	308 42.7	01.5	254 15.4	36.8			
	06	52 32.9	308 23.0	N21 37.7	334 49.6	N22 41.8	323 44.7	N23 01.5	269 17.6	N15 36.7	Alioth	166 44.8	N56 05.1
	07	67 35.3	323 22.3	37.5	349 50.3	42.0	338 46.7	01.5	284 19.7	36.6	Alkaid	153 20.4	N49 25.8
	08	82 37.8	338 21.7	37.4	4 51.0	42.2	353 48.7	01.5	299 21.9	36.5	Al Na'ir	28 17.1	S47 04.0
S	09	97 40.3	353 21.0	·· 37.2	19 51.7	·· 42.4	8 50.6	·· 01.5	314 24.0	·· 36.4	Alnilam	276 13.9	S 1 12.9
U	10	112 42.7	8 20.4	37.1	34 52.4	42.5	23 52.6	01.5	329 26.2	36.3	Alphard	218 22.9	S 8 33.7
N	11	127 45.2	23 19.7	36.9	49 53.1	42.7	38 54.6	01.5	344 28.3	36.2			
D	12	142 47.7	38 19.1	N21 36.8	64 53.8	N22 42.9	53 56.6	N23 01.5	359 30.5	N15 36.1	Alphecca	126 33.9	N26 47.7
A	13	157 50.1	53 18.4	36.6	79 54.6	43.1	68 58.5	01.5	14 32.6	36.1	Alpheratz	358 11.1	N28 58.0
Y	14	172 52.6	68 17.8	36.5	94 55.3	43.2	84 00.5	01.5	29 34.8	36.0	Altair	62 34.2	N 8 48.8
	15	187 55.1	83 17.1	·· 36.3	109 56.0	·· 43.4	99 02.5	·· 01.5	44 36.9	·· 35.9	Ankaa	353 42.0	S42 25.4
	16	202 57.5	98 16.5	36.2	124 56.7	43.6	114 04.5	01.5	59 39.1	35.8	Antares	112 59.3	S26 22.9
	17	218 00.0	113 15.8	36.0	139 57.4	43.8	129 06.4	01.5	74 41.2	35.7			
	18	233 02.5	128 15.1	N21 35.9	154 58.1	N22 43.9	144 08.4	N23 01.5	89 43.4	N15 35.6	Arcturus	146 20.5	N19 18.1
	19	248 04.9	143 14.5	35.7	169 58.8	44.1	159 10.4	01.5	104 45.5	35.5	Atria	108 25.1	S68 59.4
	20	263 07.4	158 13.8	35.6	184 59.5	44.3	174 12.4	01.6	119 47.7	35.4	Avior	234 29.6	S59 26.2
	21	278 09.8	173 13.2	·· 35.4	200 00.2	·· 44.5	189 14.4	·· 01.6	134 49.8	·· 35.3	Bellatrix	279 01.1	N 6 19.8
	22	293 12.3	188 12.5	35.3	215 00.9	44.6	204 16.3	01.6	149 51.9	35.2	Betelgeuse	271 30.7	N 7 24.2
	23	308 14.8	203 11.9	35.1	230 01.6	44.8	219 18.3	01.6	164 54.1	35.1			
15	00	323 17.2	218 11.2	N21 34.9	245 02.3	N22 45.0	234 20.3	N23 01.6	179 56.2	N15 35.0	Canopus	264 08.5	S52 40.9
	01	338 19.7	233 10.6	34.8	260 03.0	45.1	249 22.3	01.6	194 58.4	34.9	Capella	281 14.6	N45 58.3
	02	353 22.2	248 09.9	34.6	275 03.7	45.3	264 24.2	01.6	210 00.5	34.8	Deneb	49 49.4	N45 12.2
	03	8 24.6	263 09.2	·· 34.5	290 04.4	·· 45.5	279 26.2	·· 01.6	225 02.7	·· 34.7	Denebola	183 01.4	N14 41.9
	04	23 27.1	278 08.6	34.3	305 05.1	45.7	294 28.2	01.6	240 04.8	34.6	Diphda	349 22.7	S18 06.4
	05	38 29.6	293 07.9	34.1	320 05.8	45.8	309 30.2	01.6	255 07.0	34.5			
	06	53 32.0	308 07.3	N21 34.0	335 06.5	N22 46.0	324 32.1	N23 01.6	270 09.1	N15 34.4	Dubhe	194 25.4	N61 52.4
	07	68 34.5	323 06.6	33.8	350 07.2	46.2	339 34.1	01.6	285 11.3	34.3	Elnath	278 46.9	N28 35.2
	08	83 36.9	338 06.0	33.6	5 07.9	46.3	354 36.1	01.6	300 13.4	34.2	Eltanin	90 58.4	N51 29.9
M	09	98 39.4	353 05.3	·· 33.5	20 08.6	·· 46.5	9 38.1	·· 01.6	315 15.6	·· 34.1	Enif	34 13.3	N 9 46.5
O	10	113 41.9	8 04.7	33.3	35 09.3	46.7	24 40.1	01.6	330 17.7	34.0	Fomalhaut	15 53.4	S29 44.2
N	11	128 44.3	23 04.0	33.1	50 10.0	46.8	39 42.0	01.6	345 19.9	33.9			
D	12	143 46.8	38 03.3	N21 33.0	65 10.7	N22 47.0	54 44.0	N23 01.6	0 22.0	N15 33.8	Gacrux	172 31.3	S56 59.4
A	13	158 49.3	53 02.7	32.8	80 11.4	47.2	69 46.0	01.6	15 24.2	33.7	Gienah	176 20.3	S17 25.1
Y	14	173 51.7	68 02.0	32.6	95 12.2	47.3	84 48.0	01.6	30 26.3	33.6	Hadar	149 26.4	S60 16.1
	15	188 54.2	83 01.4	·· 32.4	110 12.9	·· 47.5	99 50.0	·· 01.6	45 28.5	·· 33.5	Hamal	328 31.1	N23 21.4
	16	203 56.7	98 00.7	32.3	125 13.6	47.7	114 51.9	01.7	60 30.6	33.4	Kaus Aust.	84 19.3	S34 23.7
	17	218 59.1	113 00.1	32.1	140 14.3	47.8	129 53.9	01.7	75 32.8	33.3			
	18	234 01.6	127 59.4	N21 31.9	155 15.0	N22 48.0	144 55.9	N23 01.7	90 34.9	N15 33.2	Kochab	137 19.2	N74 15.2
	19	249 04.1	142 58.7	31.7	170 15.7	48.2	159 57.9	01.7	105 37.1	33.1	Markab	14 04.9	N15 05.2
	20	264 06.5	157 58.1	31.6	185 16.4	48.3	174 59.9	01.7	120 39.2	33.0	Menkar	314 43.3	N 4 00.2
	21	279 09.0	172 57.4	·· 31.4	200 17.1	·· 48.5	190 01.8	·· 01.7	135 41.4	·· 32.9	Menkent	148 39.5	S36 15.7
	22	294 11.4	187 56.8	31.2	215 17.8	48.7	205 03.8	01.7	150 43.5	32.8	Miaplacidus	221 46.2	S69 37.6
	23	309 13.9	202 56.1	31.0	230 18.5	48.8	220 05.8	01.7	165 45.7	32.7			
16	00	324 16.4	217 55.5	N21 30.8	245 19.2	N22 49.0	235 07.8	N23 01.7	180 47.8	N15 32.6	Mirfak	309 19.0	N49 46.7
	01	339 18.8	232 54.8	30.6	260 19.9	49.1	250 09.8	01.7	195 50.0	32.5	Nunki	76 31.4	S26 19.4
	02	354 21.3	247 54.1	30.5	275 20.6	49.3	265 11.8	01.7	210 52.1	32.4	Peacock	54 01.1	S56 48.4
	03	9 23.8	262 53.5	·· 30.3	290 21.3	·· 49.5	280 13.7	·· 01.7	225 54.2	·· 32.3	Pollux	244 01.0	N28 04.8
	04	24 26.2	277 52.8	30.1	305 22.1	49.6	295 15.7	01.7	240 56.4	32.2	Procyon	245 28.2	N 5 16.9
	05	39 28.7	292 52.2	29.9	320 22.8	49.8	310 17.7	01.7	255 58.5	32.1			
	06	54 31.2	307 51.5	N21 29.7	335 23.5	N22 50.0	325 19.7	N23 01.7	271 00.7	N15 32.0	Rasalhague	96 31.3	N12 34.8
	07	69 33.6	322 50.8	29.5	350 24.2	50.1	340 21.7	01.7	286 02.8	31.9	Regulus	208 12.5	N12 04.6
T	08	84 36.1	337 50.2	29.3	5 24.9	50.3	355 23.6	01.7	301 05.0	31.8	Rigel	281 38.2	S 8 13.6
U	09	99 38.6	352 49.5	·· 29.1	20 25.6	·· 50.4	10 25.6	·· 01.7	316 07.1	·· 31.7	Rigil Kent.	140 28.6	S60 44.7
E	10	114 41.0	7 48.9	28.9	35 26.3	50.6	25 27.6	01.7	331 09.3	31.6	Sabik	102 43.3	S15 41.7
S	11	129 43.5	22 48.2	28.7	50 27.0	50.8	40 29.6	01.7	346 11.4	31.5			
D	12	144 45.9	37 47.6	N21 28.5	65 27.7	N22 50.9	55 31.6	N23 01.7	1 13.6	N15 31.4	Schedar	350 10.9	N56 24.8
A	13	159 48.4	52 46.9	28.3	80 28.4	51.1	70 33.6	01.8	16 15.7	31.3	Shaula	96 58.3	S37 05.3
Y	14	174 50.9	67 46.2	28.1	95 29.1	51.2	85 35.5	01.8	31 17.9	31.2	Sirius	258 57.8	S16 41.1
	15	189 53.3	82 45.6	·· 27.9	110 29.8	·· 51.4	100 37.5	·· 01.8	46 20.0	·· 31.1	Spica	158 59.9	S11 02.6
	16	204 55.8	97 44.9	27.7	125 30.6	51.5	115 39.5	01.8	61 22.2	31.0	Suhail	223 12.7	S43 20.5
	17	219 58.3	112 44.3	27.5	140 31.3	51.7	130 41.5	01.8	76 24.3	30.9			
	18	235 00.7	127 43.6	N21 27.3	155 32.0	N22 51.9	145 43.5	N23 01.8	91 26.5	N15 30.8	Vega	80 56.9	N38 46.1
	19	250 03.2	142 43.0	27.1	170 32.7	52.0	160 45.5	01.8	106 28.6	30.7	Zuben'ubi	137 35.4	S15 56.9
	20	265 05.7	157 42.3	26.9	185 33.4	52.2	175 47.5	01.8	121 30.8	30.6			
	21	280 08.1	172 41.6	·· 26.7	200 34.1	·· 52.3	190 49.4	·· 01.8	136 32.9	·· 30.5			
	22	295 10.6	187 41.0	26.5	215 34.8	52.5	205 51.4	01.8	151 35.1	30.4			
	23	310 13.0	202 40.3	26.3	230 35.5	52.6	220 53.4	01.8	166 37.2	30.3			
Mer. Pass.		h m 2 26.4	v −0.7	d 0.2	v 0.7	d 0.2	v 2.0	d 0.0	v 2.1	d 0.1			

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	254 54.0	9 28
Mars	281 45.1	7 39
Jupiter	271 03.0	8 22
Saturn	216 39.0	11 59

	G.M.T.	SUN		MOON				
		G.H.A.	Dec.	G.H.A.	v	Dec.	d	H.P.
	d h	° ′	° ′	° ′	′	° ′	′	′
	14 00	178 49.1	N14 28.0	190 38.2	11.9	N13 07.3	7.4	55.8
	01	193 49.2	27.2	205 09.1	11.9	12 59.9	7.3	55.8
	02	208 49.3	26.4	219 40.0	11.9	12 52.6	7.5	55.8
	03	223 49.4	·· 25.6	234 10.9	11.9	12 45.1	7.5	55.8
	04	238 49.5	24.9	248 41.8	12.0	12 37.6	7.6	55.9
	05	253 49.6	24.1	263 12.8	11.9	12 30.0	7.7	55.9
	06	268 49.7	N14 23.3	277 43.7	11.9	N12 22.3	7.7	55.9
	07	283 49.9	22.6	292 14.6	12.0	12 14.6	7.8	55.9
	08	298 50.0	21.8	306 45.6	11.9	12 06.8	7.9	55.9
S	09	313 50.1	·· 21.0	321 16.5	12.0	11 58.9	7.9	56.0
U	10	328 50.2	20.3	335 47.5	11.9	11 51.0	8.0	56.0
N	11	343 50.3	19.5	350 18.4	12.0	11 43.0	8.0	56.0
D	12	358 50.4	N14 18.7	4 49.4	12.0	N11 35.0	8.1	56.0
A	13	13 50.6	17.9	19 20.4	11.9	11 26.9	8.2	56.1
Y	14	28 50.7	17.2	33 51.3	12.0	11 18.7	8.3	56.1
	15	43 50.8	·· 16.4	48 22.3	12.0	11 10.4	8.3	56.1
	16	58 50.9	15.6	62 53.3	12.0	11 02.1	8.3	56.1
	17	73 51.0	14.8	77 24.3	12.0	10 53.8	8.4	56.1
	18	88 51.1	N14 14.1	91 55.3	12.0	N10 45.4	8.5	56.2
	19	103 51.3	13.3	106 26.3	12.0	10 36.9	8.6	56.2
	20	118 51.4	12.5	120 57.3	12.0	10 28.3	8.6	56.2
	21	133 51.5	·· 11.7	135 28.3	12.0	10 19.7	8.6	56.2
	22	148 51.6	11.0	149 59.3	12.0	10 11.1	8.7	56.3
	23	163 51.7	10.2	164 30.3	12.0	10 02.4	8.8	56.3
	15 00	178 51.9	N14 09.4	179 01.3	12.0	N 9 53.6	8.8	56.3
	01	193 52.0	08.6	193 32.3	12.0	9 44.8	8.9	56.3
	02	208 52.1	07.9	208 03.3	12.1	9 35.9	8.9	56.3
	03	223 52.2	·· 07.1	222 34.4	12.0	9 27.0	9.0	56.4
	04	238 52.3	06.3	237 05.4	12.0	9 18.0	9.0	56.4
	05	253 52.5	05.5	251 36.4	12.1	9 09.0	9.1	56.4
	06	268 52.6	N14 04.7	266 07.5	12.0	N 8 59.9	9.1	56.4
	07	283 52.7	04.0	280 38.5	12.0	8 50.8	9.2	56.5
	08	298 52.8	03.2	295 09.5	12.1	8 41.6	9.3	56.5
M	09	313 52.9	·· 02.4	309 40.6	12.0	8 32.3	9.2	56.5
O	10	328 53.1	01.6	324 11.6	12.0	8 23.1	9.4	56.5
N	11	343 53.2	00.8	338 42.6	12.1	8 13.7	9.4	56.5
D	12	358 53.3	N14 00.1	353 13.7	12.0	N 8 04.3	9.4	56.6
A	13	13 53.4	13 59.3	7 44.7	12.0	7 54.9	9.5	56.6
Y	14	28 53.5	58.5	22 15.7	12.1	7 45.4	9.5	56.6
	15	43 53.7	·· 57.7	36 46.8	12.0	7 35.9	9.6	56.6
	16	58 53.8	56.9	51 17.8	12.1	7 26.3	9.6	56.7
	17	73 53.9	56.1	65 48.9	12.0	7 16.7	9.6	56.7
	18	88 54.0	N13 55.4	80 19.9	12.0	N 7 07.1	9.7	56.7
	19	103 54.2	54.6	94 50.9	12.1	6 57.4	9.7	56.7
	20	118 54.3	53.8	109 22.0	12.0	6 47.7	9.8	56.7
	21	133 54.4	·· 53.0	123 53.0	12.0	6 37.9	9.8	56.8
	22	148 54.5	52.2	138 24.0	12.0	6 28.1	9.9	56.8
	23	163 54.7	51.4	152 55.0	12.1	6 18.2	9.9	56.8
	16 00	178 54.8	N13 50.6	167 26.1	12.0	N 6 08.3	9.9	56.8
	01	193 54.9	49.9	181 57.1	12.0	5 58.4	10.0	56.8
	02	208 55.0	49.1	196 28.1	12.0	5 48.4	10.0	56.9
	03	223 55.2	·· 48.3	210 59.1	12.0	5 38.4	10.0	56.9
	04	238 55.3	47.5	225 30.1	12.0	5 28.4	10.1	56.9
	05	253 55.4	46.7	240 01.1	12.0	5 18.3	10.1	56.9
	06	268 55.5	N13 45.9	254 32.1	12.0	N 5 08.2	10.1	57.0
	07	283 55.7	45.1	269 03.1	12.0	4 58.1	10.2	57.0
	08	298 55.8	44.3	283 34.1	11.9	4 47.9	10.2	57.0
T	09	313 55.9	·· 43.6	298 05.0	12.0	4 37.7	10.2	57.0
U	10	328 56.0	42.8	312 36.0	12.0	4 27.5	10.3	57.0
E	11	343 56.2	42.0	327 07.0	11.9	4 17.2	10.3	57.1
S	12	358 56.3	N13 41.2	341 37.9	12.0	N 4 06.9	10.3	57.1
D	13	13 56.4	40.4	356 08.9	11.9	3 56.6	10.3	57.1
A	14	28 56.6	39.6	10 39.8	11.9	3 46.3	10.4	57.1
Y	15	43 56.7	·· 38.8	25 10.7	11.9	3 35.9	10.4	57.1
	16	58 56.8	38.0	39 41.6	11.9	3 25.5	10.4	57.2
	17	73 56.9	37.2	54 12.5	11.9	3 15.1	10.5	57.2
	18	88 57.1	N13 36.4	68 43.4	11.9	N 3 04.6	10.4	57.2
	19	103 57.2	35.6	83 14.3	11.9	2 54.2	10.5	57.2
	20	118 57.3	34.8	97 45.2	11.8	2 43.7	10.5	57.3
	21	133 57.5	·· 34.0	112 16.0	11.9	2 33.2	10.6	57.3
	22	148 57.6	33.3	126 46.9	11.8	2 22.6	10.5	57.3
	23	163 57.7	32.5	141 17.7	11.8	2 12.1	10.6	57.3
		S.D. 15.8	d 0.8	S.D. 15.3		15.4		15.6

Lat.	Twilight		Sunrise	Moonrise			
	Naut.	Civil		14	15	16	17
°	h m	h m	h m	h m	h m	h m	h m
N 72	////	////	02 23	02 26	04 13	05 59	07 46
N 70	////	////	02 55	02 51	04 28	06 07	07 46
68	////	01 42	03 19	03 09	04 40	06 13	07 47
66	////	02 20	03 37	03 24	04 49	06 18	07 47
64	////	02 46	03 51	03 36	04 57	06 22	07 48
62	01 31	03 06	04 03	03 46	05 04	06 25	07 48
60	02 05	03 22	04 14	03 55	05 10	06 29	07 49
N 58	02 29	03 35	04 23	04 02	05 16	06 31	07 49
56	02 48	03 47	04 30	04 09	05 20	06 34	07 49
54	03 03	03 57	04 37	04 15	05 24	06 36	07 49
52	03 16	04 05	04 44	04 20	05 28	06 38	07 50
50	03 27	04 13	04 49	04 25	05 31	06 40	07 50
45	03 50	04 29	05 01	04 36	05 39	06 44	07 50
N 40	04 07	04 42	05 11	04 44	05 45	06 47	07 51
35	04 21	04 53	05 20	04 52	05 50	06 50	07 51
30	04 32	05 02	05 27	04 58	05 55	06 53	07 51
20	04 50	05 17	05 40	05 09	06 03	06 57	07 52
N 10	05 04	05 29	05 51	05 19	06 10	07 01	07 52
0	05 15	05 40	06 01	05 29	06 17	07 04	07 53
S 10	05 25	05 50	06 11	05 38	06 23	07 08	07 53
20	05 33	05 59	06 22	05 48	06 30	07 12	07 54
30	05 41	06 09	06 34	05 59	06 38	07 16	07 54
35	05 45	06 15	06 41	06 05	06 43	07 19	07 55
40	05 49	06 20	06 48	06 12	06 48	07 22	07 55
45	05 53	06 27	06 58	06 21	06 54	07 25	07 55
S 50	05 57	06 35	07 08	06 31	07 01	07 29	07 56
52	05 58	06 38	07 13	06 36	07 04	07 31	07 56
54	06 00	06 42	07 19	06 41	07 08	07 33	07 57
56	06 02	06 46	07 25	06 47	07 12	07 35	07 57
58	06 04	06 50	07 32	06 53	07 16	07 37	07 57
S 60	06 06	06 55	07 40	07 00	07 21	07 40	07 58

Lat.	Sunset	Twilight		Moonset			
		Civil	Naut.	14	15	16	17
°	h m	h m	h m	h m	h m	h m	h m
N 72	21 40	////	////	20 13	20 07	20 01	19 55
N 70	21 10	23 36	////	19 57	19 57	19 58	19 57
68	20 47	22 20	////	19 44	19 50	19 55	19 59
66	20 30	21 44	////	19 33	19 43	19 52	20 01
64	20 15	21 20	23 39	19 24	19 38	19 50	20 02
62	20 04	21 00	22 32	19 16	19 33	19 48	20 03
60	19 54	20 45	22 00	19 09	19 29	19 47	20 04
N 58	19 45	20 32	21 37	19 03	19 25	19 45	20 05
56	19 37	20 20	21 18	18 58	19 22	19 44	20 06
54	19 30	20 11	21 04	18 53	19 19	19 43	20 07
52	19 24	20 02	20 51	18 49	19 16	19 42	20 07
50	19 19	19 55	20 40	18 45	19 14	19 41	20 08
45	19 07	19 39	20 18	18 36	19 08	19 39	20 09
N 40	18 57	19 26	20 01	18 29	19 04	19 37	20 10
35	18 49	19 15	19 47	18 23	19 00	19 35	20 11
30	18 41	19 06	19 36	18 17	18 56	19 34	20 12
20	18 29	18 52	19 19	18 08	18 50	19 32	20 14
N 10	18 18	18 40	19 05	18 00	18 45	19 29	20 15
0	18 08	18 29	18 54	17 52	18 39	19 27	20 16
S 10	17 58	18 19	18 44	17 44	18 34	19 25	20 17
20	17 47	18 10	18 36	17 35	18 29	19 23	20 18
30	17 35	18 00	18 28	17 25	18 22	19 21	20 20
35	17 29	17 55	18 25	17 20	18 19	19 19	20 20
40	17 21	17 49	18 21	17 13	18 15	19 17	20 21
45	17 12	17 42	18 17	17 06	18 10	19 15	20 22
S 50	17 01	17 35	18 13	16 56	18 04	19 13	20 24
52	16 56	17 32	18 11	16 52	18 01	19 12	20 24
54	16 51	17 28	18 10	16 48	17 58	19 11	20 25
56	16 45	17 24	18 08	16 42	17 55	19 09	20 25
58	16 38	17 20	18 06	16 37	17 51	19 08	20 26
S 60	16 30	17 15	18 04	16 30	17 47	19 06	20 27

Day	SUN			MOON			
	Eqn. of Time		Mer. Pass.	Mer. Pass.		Age	Phase
	00ʰ	12ʰ		Upper	Lower		
	m s	m s	h m	h m	h m	d	
14	04 44	04 38	12 05	11 40	24 04	29	
15	04 33	04 27	12 04	12 28	00 04	01	●
16	04 21	04 15	12 04	13 16	00 52	02	

1977 AUGUST 17, 18, 19 (WED., THURS., FRI.)

G.M.T.			ARIES	VENUS −3.5		MARS +1.1		JUPITER −1.7		SATURN +0.6	
			G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
d		h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
17		00	325 15.5	217 39.7	N21 26.1	245 36.2	N22 52.8	235 55.4	N23 01.8	181 39.4	N15 30.2
		01	340 18.0	232 39.0	25.9	260 36.9	53.0	250 57.4	01.8	196 41.5	30.1
		02	355 20.4	247 38.3	25.7	275 37.7	53.1	265 59.4	01.8	211 43.7	30.0
		03	10 22.9	262 37.7	·· 25.5	290 38.4	·· 53.3	281 01.4	·· 01.8	226 45.8	·· 29.9
		04	25 25.4	277 37.0	25.3	305 39.1	53.4	296 03.3	01.8	241 48.0	29.8
		05	40 27.8	292 36.4	25.1	320 39.8	53.6	311 05.3	01.8	256 50.1	29.7
		06	55 30.3	307 35.7	N21 24.8	335 40.5	N22 53.7	326 07.3	N23 01.8	271 52.3	N15 29.6
	W	07	70 32.8	322 35.0	24.6	350 41.2	53.9	341 09.3	01.8	286 54.4	29.5
	E	08	85 35.2	337 34.4	24.4	5 41.9	54.0	356 11.3	01.8	301 56.6	29.4
	D	09	100 37.7	352 33.7	·· 24.2	20 42.6	·· 54.2	11 13.3	·· 01.8	316 58.7	·· 29.3
	N	10	115 40.2	7 33.1	24.0	35 43.3	54.3	26 15.3	01.8	332 00.9	29.2
	E	11	130 42.6	22 32.4	23.8	50 44.1	54.5	41 17.2	01.8	347 03.0	29.1
	S	12	145 45.1	37 31.8	N21 23.5	65 44.8	N22 54.6	56 19.2	N23 01.8	2 05.2	N15 29.0
	D	13	160 47.5	52 31.1	23.3	80 45.5	54.8	71 21.2	01.8	17 07.3	28.9
	A	14	175 50.0	67 30.4	23.1	95 46.2	54.9	86 23.2	01.9	32 09.4	28.8
	Y	15	190 52.5	82 29.8	·· 22.9	110 46.9	·· 55.1	101 25.2	·· 01.9	47 11.6	·· 28.7
		16	205 54.9	97 29.1	22.6	125 47.6	55.2	116 27.2	01.9	62 13.7	28.6
		17	220 57.4	112 28.5	22.4	140 48.3	55.4	131 29.2	01.9	77 15.9	28.5
		18	235 59.9	127 27.8	N21 22.2	155 49.1	N22 55.5	146 31.2	N23 01.9	92 18.0	N15 28.4
		19	251 02.3	142 27.1	22.0	170 49.8	55.7	161 33.2	01.9	107 20.2	28.3
		20	266 04.8	157 26.5	21.7	185 50.5	55.8	176 35.1	01.9	122 22.3	28.2
		21	281 07.3	172 25.8	·· 21.5	200 51.2	·· 56.0	191 37.1	·· 01.9	137 24.5	·· 28.1
		22	296 09.7	187 25.2	21.3	215 51.9	56.1	206 39.1	01.9	152 26.6	28.0
		23	311 12.2	202 24.5	21.0	230 52.6	56.3	221 41.1	01.9	167 28.8	27.9
18		00	326 14.7	217 23.8	N21 20.8	245 53.3	N22 56.4	236 43.1	N23 01.9	182 30.9	N15 27.8
		01	341 17.1	232 23.2	20.6	260 54.0	56.6	251 45.1	01.9	197 33.1	27.7
		02	356 19.6	247 22.5	20.3	275 54.8	56.7	266 47.1	01.9	212 35.2	27.6
		03	11 22.0	262 21.9	·· 20.1	290 55.5	·· 56.9	281 49.1	·· 01.9	227 37.4	·· 27.5
		04	26 24.5	277 21.2	19.9	305 56.2	57.0	296 51.1	01.9	242 39.5	27.4
		05	41 27.0	292 20.6	19.6	320 56.9	57.2	311 53.1	01.9	257 41.7	27.3
		06	56 29.4	307 19.9	N21 19.4	335 57.6	N22 57.3	326 55.0	N23 01.9	272 43.8	N15 27.2
		07	71 31.9	322 19.2	19.2	350 58.3	57.5	341 57.0	01.9	287 46.0	27.1
	T	08	86 34.4	337 18.6	18.9	5 59.1	57.6	356 59.0	01.9	302 48.1	27.0
	H	09	101 36.8	352 17.9	·· 18.7	20 59.8	·· 57.8	12 01.0	·· 01.9	317 50.3	·· 26.9
	U	10	116 39.3	7 17.3	18.4	36 00.5	57.9	27 03.0	01.9	332 52.4	26.8
	R	11	131 41.8	22 16.6	18.2	51 01.2	58.0	42 05.0	01.9	347 54.6	26.7
	S	12	146 44.2	37 15.9	N21 17.9	66 01.9	N22 58.2	57 07.0	N23 01.9	2 56.7	N15 26.6
	D	13	161 46.7	52 15.3	17.7	81 02.6	58.3	72 09.0	01.9	17 58.9	26.5
	A	14	176 49.1	67 14.6	17.5	96 03.3	58.5	87 11.0	01.9	33 01.0	26.4
	Y	15	191 51.6	82 14.0	·· 17.2	111 04.1	·· 58.6	102 13.0	·· 01.9	48 03.2	·· 26.3
		16	206 54.1	97 13.3	17.0	126 04.8	58.8	117 15.0	01.9	63 05.3	26.2
		17	221 56.5	112 12.6	16.7	141 05.5	58.9	132 17.0	01.9	78 07.5	26.1
		18	236 59.0	127 12.0	N21 16.5	156 06.2	N22 59.0	147 19.0	N23 01.9	93 09.6	N15 26.0
		19	252 01.5	142 11.3	16.2	171 06.9	59.2	162 21.0	01.9	108 11.8	25.9
		20	267 03.9	157 10.7	16.0	186 07.6	59.3	177 22.9	01.9	123 13.9	25.8
		21	282 06.4	172 10.0	·· 15.7	201 08.4	·· 59.5	192 24.9	·· 02.0	138 16.1	·· 25.7
		22	297 08.9	187 09.3	15.4	216 09.1	59.6	207 26.9	02.0	153 18.2	25.6
		23	312 11.3	202 08.7	15.2	231 09.8	59.7	222 28.9	02.0	168 20.4	25.5
19		00	327 13.8	217 08.0	N21 14.9	246 10.5	N22 59.9	237 30.9	N23 02.0	183 22.5	N15 25.4
		01	342 16.3	232 07.4	14.7	261 11.2	23 00.0	252 32.9	02.0	198 24.7	25.3
		02	357 18.7	247 06.7	14.4	276 12.0	00.2	267 34.9	02.0	213 26.8	25.2
		03	12 21.2	262 06.0	·· 14.2	291 12.7	·· 00.3	282 36.9	·· 02.0	228 29.0	·· 25.1
		04	27 23.6	277 05.4	13.9	306 13.4	00.4	297 38.9	02.0	243 31.1	25.0
		05	42 26.1	292 04.7	13.6	321 14.1	00.6	312 40.9	02.0	258 33.3	25.0
		06	57 28.6	307 04.1	N21 13.4	336 14.8	N23 00.7	327 42.9	N23 02.0	273 35.4	N15 24.9
		07	72 31.0	322 03.4	13.1	351 15.5	00.9	342 44.9	02.0	288 37.6	24.8
		08	87 33.5	337 02.7	12.8	6 16.3	01.0	357 46.9	02.0	303 39.7	24.7
	F	09	102 36.0	352 02.1	·· 12.6	21 17.0	·· 01.1	12 48.9	·· 02.0	318 41.9	·· 24.6
	R	10	117 38.4	7 01.4	12.3	36 17.7	01.3	27 50.9	02.0	333 44.0	24.5
	I	11	132 40.9	22 00.8	12.0	51 18.4	01.4	42 52.9	02.0	348 46.2	24.4
	D	12	147 43.4	37 00.1	N21 11.8	66 19.1	N23 01.5	57 54.9	N23 02.0	3 48.3	N15 24.3
	A	13	162 45.8	51 59.5	11.5	81 19.9	01.7	72 56.9	02.0	18 50.5	24.2
	Y	14	177 48.3	66 58.8	11.2	96 20.6	01.8	87 58.9	02.0	33 52.6	24.1
		15	192 50.8	81 58.1	·· 11.0	111 21.3	·· 02.0	103 00.9	·· 02.0	48 54.8	·· 24.0
		16	207 53.2	96 57.5	10.7	126 22.0	02.1	118 02.9	02.0	63 56.9	23.9
		17	222 55.7	111 56.8	10.4	141 22.7	02.2	133 04.9	02.0	78 59.1	23.8
		18	237 58.1	126 56.2	N21 10.1	156 23.5	N23 02.4	148 06.9	N23 02.0	94 01.2	N15 23.7
		19	253 00.6	141 55.5	09.9	171 24.2	02.5	163 08.9	02.0	109 03.4	23.6
		20	268 03.1	156 54.8	09.6	186 24.9	02.6	178 10.9	02.0	124 05.5	23.5
		21	283 05.5	171 54.2	·· 09.3	201 25.6	·· 02.8	193 12.9	·· 02.0	139 07.7	·· 23.4
		22	298 08.0	186 53.5	09.0	216 26.4	02.9	208 14.8	02.0	154 09.8	23.3
		23	313 10.5	201 52.9	08.7	231 27.1	03.0	223 16.8	02.0	169 12.0	23.2
Mer. Pass.			h m 2 14.7	*v* −0.7	*d* 0.2	*v* 0.7	*d* 0.1	*v* 2.0	*d* 0.0	*v* 2.1	*d* 0.1

STARS		
Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 38.8	S40 23.4
Achernar	335 46.6	S57 20.7
Acrux	173 39.9	S62 58.7
Adhara	255 34.0	S28 56.4
Aldebaran	291 20.4	N16 27.8
Alioth	166 44.8	N56 05.1
Alkaid	153 20.4	N49 25.8
Al Na'ir	28 17.1	S47 04.0
Alnilam	276 13.9	S 1 12.9
Alphard	218 22.9	S 8 33.7
Alphecca	126 33.9	N26 47.7
Alpheratz	358 11.1	N28 58.1
Altair	62 34.2	N 8 48.8
Ankaa	353 42.0	S42 25.4
Antares	112 59.3	S26 22.9
Arcturus	146 20.5	N19 18.1
Atria	108 25.1	S68 59.4
Avior	234 29.6	S59 26.2
Bellatrix	279 01.1	N 6 19.8
Betelgeuse	271 30.7	N 7 24.2
Canopus	264 08.5	S52 40.9
Capella	281 14.5	N45 58.3
Deneb	49 49.4	N45 12.3
Denebola	183 01.4	N14 41.9
Diphda	349 22.7	S18 06.4
Dubhe	194 25.4	N61 52.4
Elnath	278 46.9	N28 35.2
Eltanin	90 58.4	N51 29.9
Enif	34 13.3	N 9 46.5
Fomalhaut	15 53.4	S29 44.2
Gacrux	172 31.4	S56 59.4
Gienah	176 20.3	S17 25.1
Hadar	149 26.4	S60 16.1
Hamal	328 31.1	N23 21.4
Kaus Aust.	84 19.3	S34 23.7
Kochab	137 19.3	N74 15.2
Markab	14 04.9	N15 05.2
Menkar	314 43.2	N 4 00.2
Menkent	148 39.6	S36 15.7
Miaplacidus	221 46.2	S69 37.6
Mirfak	309 19.0	N49 46.7
Nunki	76 31.5	S26 19.4
Peacock	54 01.1	S56 48.4
Pollux	244 01.0	N28 04.8
Procyon	245 28.2	N 5 17.0
Rasalhague	96 31.3	N12 34.8
Regulus	208 12.5	N12 04.6
Rigel	281 38.1	S 8 13.6
Rigil Kent.	140 28.7	S60 44.7
Sabik	102 43.4	S15 41.7
Schedar	350 10.9	N56 24.8
Shaula	96 58.3	S37 05.3
Sirius	258 57.8	S16 41.1
Spica	158 59.9	S11 02.6
Suhail	223 12.7	S43 20.5
Vega	80 56.9	N38 46.1
Zuben'ubi	137 35.4	S15 56.9

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	251 09.2	9 31
Mars	279 38.7	7 36
Jupiter	270 28.5	8 12
Saturn	216 16.3	11 48

G.M.T.		SUN G.H.A.	SUN Dec.	MOON G.H.A.	v	MOON Dec.	d	H.P.
d h		° ′	° ′	° ′	′	° ′	′	′
17 00		178 57.9	N13 31.7	155 48.5	11.8	N 2 01.5	10.5	57.3
01		193 58.0	30.9	170 19.3	11.8	1 51.0	10.6	57.4
02		208 58.1	30.1	184 50.1	11.8	1 40.4	10.6	57.4
03		223 58.2	·· 29.3	199 20.9	11.7	1 29.8	10.7	57.4
04		238 58.4	28.5	213 51.6	11.8	1 19.1	10.6	57.4
05		253 58.5	27.7	228 22.4	11.7	1 08.5	10.7	57.4
06		268 58.6	N13 26.9	242 53.1	11.7	N 0 57.8	10.6	57.5
07	W	283 58.8	26.1	257 23.8	11.7	0 47.2	10.7	57.5
08	E	298 58.9	25.3	271 54.5	11.7	0 36.5	10.7	57.5
09	D	313 59.0	·· 24.5	286 25.2	11.6	0 25.8	10.7	57.5
10	N	328 59.2	23.7	300 55.8	11.7	0 15.1	10.7	57.5
11	E	343 59.3	22.9	315 26.5	11.6	N 0 04.4	10.7	57.6
12	S	358 59.4	N13 22.1	329 57.1	11.6	S 0 06.3	10.7	57.6
13	D	13 59.6	21.3	344 27.7	11.6	0 17.0	10.7	57.6
14	A	28 59.7	20.5	358 58.3	11.5	0 27.7	10.7	57.6
15	Y	43 59.8	·· 19.7	13 28.8	11.5	0 38.4	10.7	57.6
16		59 00.0	18.9	27 59.3	11.6	0 49.1	10.8	57.7
17		74 00.1	18.1	42 29.9	11.4	0 59.9	10.7	57.7
18		89 00.2	N13 17.3	57 00.3	11.5	S 1 10.6	10.7	57.7
19		104 00.4	16.5	71 30.8	11.4	1 21.3	10.7	57.7
20		119 00.5	15.7	86 01.2	11.5	1 32.0	10.8	57.7
21		134 00.6	·· 14.9	100 31.7	11.3	1 42.8	10.7	57.8
22		149 00.8	14.1	115 02.0	11.4	1 53.5	10.7	57.8
23		164 00.9	13.3	129 32.4	11.3	2 04.2	10.7	57.8
18 00		179 01.1	N13 12.5	144 02.7	11.3	S 2 14.9	10.7	57.8
01		194 01.2	11.7	158 33.0	11.3	2 25.6	10.7	57.8
02		209 01.3	10.9	173 03.3	11.3	2 36.3	10.7	57.9
03		224 01.5	·· 10.0	187 33.6	11.2	2 47.0	10.7	57.9
04		239 01.6	09.2	202 03.8	11.2	2 57.7	10.7	57.9
05		254 01.7	08.4	216 34.0	11.2	3 08.4	10.6	57.9
06		269 01.9	N13 07.6	231 04.2	11.1	S 3 19.0	10.7	57.9
07		284 02.0	06.8	245 34.3	11.1	3 29.7	10.6	57.9
08	T	299 02.1	06.0	260 04.4	11.1	3 40.3	10.6	58.0
09	H	314 02.3	·· 05.2	274 34.5	11.1	3 50.9	10.6	58.0
10	U	329 02.4	04.4	289 04.6	11.0	4 01.5	10.6	58.0
11	R	344 02.6	03.6	303 34.6	11.0	4 12.1	10.6	58.0
12	S	359 02.7	N13 02.8	318 04.6	10.9	S 4 22.7	10.6	58.0
13	D	14 02.8	02.0	332 34.5	10.9	4 33.3	10.5	58.1
14	A	29 03.0	01.2	347 04.4	10.9	4 43.8	10.5	58.1
15	Y	44 03.1	13 00.4	1 34.3	10.8	4 54.3	10.5	58.1
16		59 03.3	12 59.5	16 04.1	10.9	5 04.8	10.5	58.1
17		74 03.4	58.7	30 34.0	10.7	5 15.3	10.4	58.1
18		89 03.5	N12 57.9	45 03.7	10.8	S 5 25.7	10.5	58.1
19		104 03.7	57.1	59 33.5	10.7	5 36.2	10.4	58.2
20		119 03.8	56.3	74 03.2	10.6	5 46.6	10.4	58.2
21		134 04.0	·· 55.5	88 32.8	10.7	5 57.0	10.3	58.2
22		149 04.1	54.7	103 02.5	10.6	6 07.3	10.3	58.2
23		164 04.2	53.9	117 32.1	10.5	6 17.6	10.3	58.2
19 00		179 04.4	N12 53.1	132 01.6	10.5	S 6 27.9	10.3	58.2
01		194 04.5	52.2	146 31.1	10.5	6 38.2	10.2	58.3
02		209 04.7	51.4	161 00.6	10.4	6 48.4	10.2	58.3
03		224 04.8	·· 50.6	175 30.0	10.4	6 58.6	10.2	58.3
04		239 04.9	49.8	189 59.4	10.4	7 08.8	10.1	58.3
05		254 05.1	49.0	204 28.8	10.3	7 18.9	10.1	58.3
06		269 05.2	N12 48.2	218 58.1	10.2	S 7 29.0	10.1	58.3
07		284 05.4	47.4	233 27.3	10.3	7 39.1	10.0	58.4
08		299 05.5	46.5	247 56.6	10.1	7 49.1	10.0	58.4
09	F	314 05.7	·· 45.7	262 25.7	10.2	7 59.1	9.9	58.4
10	R	329 05.8	44.9	276 54.9	10.1	8 09.0	9.9	58.4
11	I	344 05.9	44.1	291 24.0	10.0	8 18.9	9.9	58.4
12	D	359 06.1	N12 43.3	305 53.0	10.0	S 8 28.8	9.8	58.4
13	A	14 06.2	42.5	320 22.0	10.0	8 38.6	9.8	58.5
14	Y	29 06.4	41.6	334 51.0	9.9	8 48.4	9.7	58.5
15		44 06.5	·· 40.8	349 19.9	9.9	8 58.1	9.7	58.5
16		59 06.7	40.0	3 48.8	9.8	9 07.8	9.6	58.5
17		74 06.8	39.2	18 17.6	9.8	9 17.4	9.6	58.5
18		89 07.0	N12 38.4	32 46.4	9.7	S 9 27.0	9.5	58.5
19		104 07.1	37.5	47 15.1	9.7	9 36.5	9.5	58.6
20		119 07.2	36.7	61 43.8	9.6	9 46.0	9.5	58.6
21		134 07.4	·· 35.9	76 12.4	9.6	9 55.5	9.3	58.6
22		149 07.5	35.1	90 41.0	9.6	10 04.8	9.4	58.6
23		164 07.7	34.3	105 09.6	9.5	10 14.2	9.2	58.6
		S.D. 15.8	*d* 0.8	S.D. 15.7		15.8		15.9

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 17	Moonrise 18	Moonrise 19	Moonrise 20
°	h m	h m	h m	h m	h m	h m	h m
N 72	////	////	02 43	07 46	09 34	11 25	13 22
N 70	////	01 11	03 11	07 46	09 28	11 12	12 59
68	////	02 04	03 31	07 47	09 23	11 01	12 40
66	////	02 35	03 47	07 47	09 19	10 52	12 26
64	01 02	02 58	04 00	07 48	09 16	10 45	12 14
62	01 50	03 16	04 11	07 48	09 13	10 38	12 04
60	02 18	03 31	04 21	07 49	09 10	10 33	11 56
N 58	02 40	03 43	04 29	07 49	09 08	10 28	11 48
56	02 57	03 54	04 36	07 49	09 06	10 24	11 42
54	03 11	04 03	04 43	07 49	09 04	10 20	11 36
52	03 23	04 11	04 48	07 50	09 02	10 16	11 31
50	03 33	04 18	04 54	07 50	09 01	10 13	11 26
45	03 54	04 33	05 05	07 50	08 58	10 06	11 16
N 40	04 11	04 45	05 14	07 51	08 55	10 01	11 07
35	04 23	04 55	05 22	07 51	08 53	09 56	11 00
30	04 34	05 04	05 29	07 51	08 51	09 52	10 53
20	04 51	05 18	05 41	07 52	08 47	09 44	10 43
N 10	05 04	05 29	05 51	07 52	08 44	09 38	10 33
0	05 15	05 39	06 00	07 53	08 42	09 32	10 24
S 10	05 23	05 48	06 10	07 53	08 39	09 26	10 15
20	05 31	05 57	06 20	07 54	08 36	09 20	10 06
30	05 38	06 06	06 31	07 54	08 33	09 13	09 55
35	05 42	06 11	06 37	07 55	08 31	09 09	09 49
40	05 45	06 17	06 44	07 55	08 29	09 04	09 42
45	05 48	06 23	06 53	07 55	08 26	08 59	09 34
S 50	05 51	06 29	07 03	07 56	08 23	08 53	09 25
52	05 53	06 32	07 07	07 56	08 22	08 50	09 20
54	05 54	06 36	07 13	07 57	08 21	08 47	09 15
56	05 56	06 39	07 18	07 57	08 19	08 43	09 10
58	05 57	06 43	07 24	07 57	08 17	08 39	09 04
S 60	05 59	06 47	07 32	07 58	08 15	08 35	08 57

Lat.	Sunset	Twilight Civil	Twilight Naut.	Moonset 17	Moonset 18	Moonset 19	Moonset 20
°	h m	h m	h m	h m	h m	h m	h m
N 72	21 20	////	////	19 55	19 49	19 43	19 35
N 70	20 53	22 46	////	19 57	19 58	19 58	20 00
68	20 34	21 58	////	19 59	20 04	20 11	20 20
66	20 18	21 28	////	20 01	20 10	20 21	20 35
64	20 05	21 06	22 56	20 02	20 15	20 29	20 48
62	19 54	20 49	22 13	20 03	20 19	20 37	20 58
60	19 45	20 35	21 46	20 04	20 23	20 43	21 08
N 58	19 37	20 23	21 25	20 05	20 26	20 49	21 16
56	19 30	20 12	21 09	20 06	20 29	20 54	21 23
54	19 24	20 03	20 55	20 07	20 31	20 58	21 29
52	19 18	19 55	20 43	20 07	20 34	21 02	21 35
50	19 13	19 48	20 33	20 08	20 36	21 06	21 40
45	19 02	19 33	20 12	20 09	20 41	21 14	21 52
N 40	18 53	19 22	19 56	20 10	20 45	21 21	22 01
35	18 45	19 12	19 43	20 11	20 48	21 27	22 09
30	18 38	19 03	19 33	20 12	20 51	21 32	22 16
20	18 27	18 49	19 16	20 14	20 56	21 41	22 29
N 10	18 17	18 38	19 03	20 15	21 01	21 49	22 40
0	18 07	18 28	18 53	20 16	21 05	21 57	22 50
S 10	17 58	18 19	18 44	20 17	21 10	22 04	23 00
20	17 48	18 11	18 37	20 18	21 14	22 12	23 11
30	17 37	18 02	18 30	20 20	21 20	22 21	23 23
35	17 31	17 57	18 27	20 20	21 23	22 26	23 30
40	17 24	17 52	18 23	20 21	21 26	22 32	23 39
45	17 15	17 46	18 20	20 22	21 30	22 39	23 48
S 50	17 06	17 39	18 17	20 24	21 35	22 48	24 00
52	17 01	17 36	18 16	20 24	21 37	22 51	24 05
54	16 56	17 33	18 14	20 25	21 40	22 56	24 11
56	16 50	17 29	18 13	20 25	21 43	23 00	24 18
58	16 44	17 25	18 12	20 26	21 46	23 06	24 25
S 60	16 37	17 21	18 10	20 27	21 49	23 12	24 34

Day	SUN Eqn. of Time 00ʰ	SUN Eqn. of Time 12ʰ	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	Age	Phase
	m s	m s	h m	h m	h m	d	
17	04 09	04 03	12 04	14 04	01 40	03	
18	03 56	03 49	12 04	14 53	02 29	04	◐
19	03 43	03 36	12 04	15 44	03 19	05	

1977 AUGUST 20, 21, 22 (SAT., SUN., MON.)

G.M.T.	ARIES	VENUS −3.5		MARS +1.1		JUPITER −1.7		SATURN +0.6	
	G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
d h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
20 00	328 12.9	216 52.2	N21 08.5	246 27.8	N23 03.2	238 18.8	N23 02.0	184 14.1	N15 23.1
01	343 15.4	231 51.5	08.2	261 28.5	03.3	253 20.8	02.0	199 16.3	23.0
02	358 17.9	246 50.9	07.9	276 29.2	03.4	268 22.8	02.0	214 18.4	22.9
03	13 20.3	261 50.2	·· 07.6	291 30.0	·· 03.5	283 24.8	·· 02.0	229 20.6	·· 22.8
04	28 22.8	276 49.6	07.3	306 30.7	03.7	298 26.8	02.0	244 22.7	22.7
05	43 25.2	291 48.9	07.0	321 31.4	03.8	313 28.8	02.0	259 24.9	22.6
06	58 27.7	306 48.2	N21 06.8	336 32.1	N23 03.9	328 30.8	N23 02.0	274 27.0	N15 22.5
07	73 30.2	321 47.6	06.5	351 32.8	04.1	343 32.8	02.0	289 29.1	22.4
S 08	88 32.6	336 46.9	06.2	6 33.6	04.2	358 34.8	02.0	304 31.3	22.3
A 09	103 35.1	351 46.3	·· 05.9	21 34.3	·· 04.3	13 36.8	·· 02.0	319 33.4	·· 22.2
T 10	118 37.6	6 45.6	05.6	36 35.0	04.5	28 38.8	02.0	334 35.6	22.1
U 11	133 40.0	21 45.0	05.3	51 35.7	04.6	43 40.8	02.0	349 37.7	22.0
R 12	148 42.5	36 44.3	N21 05.0	66 36.5	N23 04.7	58 42.9	N23 02.0	4 39.9	N15 21.9
D 13	163 45.0	51 43.6	04.7	81 37.2	04.8	73 44.9	02.1	19 42.0	21.8
A 14	178 47.4	66 43.0	04.4	96 37.9	05.0	88 46.9	02.1	34 44.2	21.7
Y 15	193 49.9	81 42.3	·· 04.1	111 38.6	·· 05.1	103 48.9	·· 02.1	49 46.3	·· 21.6
16	208 52.4	96 41.7	03.8	126 39.4	05.2	118 50.9	02.1	64 48.5	21.5
17	223 54.8	111 41.0	03.5	141 40.1	05.4	133 52.9	02.1	79 50.6	21.4
18	238 57.3	126 40.3	N21 03.2	156 40.8	N23 05.5	148 54.9	N23 02.1	94 52.8	N15 21.3
19	253 59.7	141 39.7	02.9	171 41.5	05.6	163 56.9	02.1	109 54.9	21.2
20	269 02.2	156 39.0	02.6	186 42.3	05.7	178 58.9	02.1	124 57.1	21.1
21	284 04.7	171 38.4	·· 02.3	201 43.0	·· 05.9	194 00.9	·· 02.1	139 59.2	·· 21.0
22	299 07.1	186 37.7	02.0	216 43.7	06.0	209 02.9	02.1	155 01.4	20.9
23	314 09.6	201 37.1	01.7	231 44.4	06.1	224 04.9	02.1	170 03.5	20.8
21 00	329 12.1	216 36.4	N21 01.4	246 45.2	N23 06.2	239 06.9	N23 02.1	185 05.7	N15 20.7
01	344 14.5	231 35.7	01.1	261 45.9	06.4	254 08.9	02.1	200 07.8	20.6
02	359 17.0	246 35.1	00.8	276 46.6	06.5	269 10.9	02.1	215 10.0	20.5
03	14 19.5	261 34.4	·· 00.5	291 47.3	·· 06.6	284 12.9	·· 02.1	230 12.1	·· 20.4
04	29 21.9	276 33.8	21 00.2	306 48.1	06.7	299 14.9	02.1	245 14.3	20.3
05	44 24.4	291 33.1	20 59.9	321 48.8	06.9	314 16.9	02.1	260 16.4	20.2
06	59 26.9	306 32.4	N20 59.6	336 49.5	N23 07.0	329 18.9	N23 02.1	275 18.6	N15 20.1
07	74 29.3	321 31.8	59.2	351 50.2	07.1	344 20.9	02.1	290 20.7	20.0
08	89 31.8	336 31.1	58.9	6 51.0	07.2	359 22.9	02.1	305 22.9	19.9
S 09	104 34.2	351 30.5	·· 58.6	21 51.7	·· 07.3	14 24.9	·· 02.1	320 25.0	·· 19.8
U 10	119 36.7	6 29.8	58.3	36 52.4	07.5	29 26.9	02.1	335 27.2	19.7
N 11	134 39.2	21 29.2	58.0	51 53.2	07.6	44 28.9	02.1	350 29.3	19.6
D 12	149 41.6	36 28.5	N20 57.7	66 53.9	N23 07.7	59 30.9	N23 02.1	5 31.5	N15 19.5
A 13	164 44.1	51 27.8	57.3	81 54.6	07.8	74 32.9	02.1	20 33.6	19.4
Y 14	179 46.6	66 27.2	57.0	96 55.3	07.9	89 35.0	02.1	35 35.8	19.3
15	194 49.0	81 26.5	·· 56.7	111 56.1	·· 08.1	104 37.0	·· 02.1	50 38.0	·· 19.2
16	209 51.5	96 25.9	56.4	126 56.8	08.2	119 39.0	02.1	65 40.1	19.1
17	224 54.0	111 25.2	56.1	141 57.5	08.3	134 41.0	02.1	80 42.3	19.0
18	239 56.4	126 24.5	N20 55.7	156 58.2	N23 08.4	149 43.0	N23 02.1	95 44.4	N15 18.9
19	254 58.9	141 23.9	55.4	171 59.0	08.5	164 45.0	02.1	110 46.6	18.8
20	270 01.3	156 23.2	55.1	186 59.7	08.7	179 47.0	02.1	125 48.7	18.7
21	285 03.8	171 22.6	·· 54.8	202 00.4	·· 08.8	194 49.0	·· 02.1	140 50.9	·· 18.6
22	300 06.3	186 21.9	54.4	217 01.2	08.9	209 51.0	02.1	155 53.0	18.5
23	315 08.7	201 21.3	54.1	232 01.9	09.0	224 53.0	02.1	170 55.2	18.4
22 00	330 11.2	216 20.6	N20 53.8	247 02.6	N23 09.1	239 55.0	N23 02.1	185 57.3	N15 18.3
01	345 13.7	231 19.9	53.4	262 03.4	09.3	254 57.0	02.1	200 59.5	18.2
02	0 16.1	246 19.3	53.1	277 04.1	09.4	269 59.0	02.1	216 01.6	18.1
03	15 18.6	261 18.6	·· 52.8	292 04.8	·· 09.5	285 01.1	·· 02.1	231 03.8	·· 18.0
04	30 21.1	276 18.0	52.4	307 05.5	09.6	300 03.1	02.1	246 05.9	17.9
05	45 23.5	291 17.3	52.1	322 06.3	09.7	315 05.1	02.1	261 08.1	17.8
06	60 26.0	306 16.7	N20 51.8	337 07.0	N23 09.8	330 07.1	N23 02.1	276 10.2	N15 17.7
07	75 28.5	321 16.0	51.4	352 07.7	09.9	345 09.1	02.1	291 12.4	17.6
08	90 30.9	336 15.4	51.1	7 08.5	10.1	0 11.1	02.1	306 14.5	17.5
M 09	105 33.4	351 14.7	·· 50.8	22 09.2	·· 10.2	15 13.1	·· 02.1	321 16.7	·· 17.4
O 10	120 35.8	6 14.0	50.4	37 09.9	10.3	30 15.1	02.1	336 18.8	17.3
N 11	135 38.3	21 13.4	50.1	52 10.7	10.4	45 17.1	02.1	351 21.0	17.2
D 12	150 40.8	36 12.7	N20 49.7	67 11.4	N23 10.5	60 19.1	N23 02.1	6 23.1	N15 17.1
A 13	165 43.2	51 12.1	49.4	82 12.1	10.6	75 21.2	02.1	21 25.3	17.0
Y 14	180 45.7	66 11.4	49.0	97 12.9	10.7	90 23.2	02.1	36 27.4	16.9
15	195 48.2	81 10.8	·· 48.7	112 13.6	·· 10.9	105 25.2	·· 02.1	51 29.6	·· 16.8
16	210 50.6	96 10.1	48.4	127 14.3	11.0	120 27.2	02.1	66 31.7	16.7
17	225 53.1	111 09.4	48.0	142 15.1	11.1	135 29.2	02.1	81 33.9	16.6
18	240 55.6	126 08.8	N20 47.7	157 15.8	N23 11.2	150 31.2	N23 02.1	96 36.0	N15 16.5
19	255 58.0	141 08.1	47.3	172 16.5	11.3	165 33.2	02.1	111 38.2	16.4
20	271 00.5	156 07.5	47.0	187 17.3	11.4	180 35.2	02.1	126 40.3	16.3
21	286 03.0	171 06.8	·· 46.6	202 18.0	·· 11.5	195 37.3	·· 02.1	141 42.5	·· 16.2
22	301 05.4	186 06.2	46.3	217 18.7	11.6	210 39.3	02.1	156 44.6	16.1
23	316 07.9	201 05.5	45.9	232 19.5	11.7	225 41.3	02.1	171 46.8	16.0
Mer. Pass.	h m 2 02.9	v −0.7	d 0.3	v 0.7	d 0.1	v 2.0	d 0.0	v 2.2	d 0.1

STARS

Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 38.7	S40 23.4
Achernar	335 46.6	S57 20.7
Acrux	173 39.9	S62 58.7
Adhara	255 34.0	S28 56.4
Aldebaran	291 20.4	N16 27.8
Alioth	166 44.8	N56 05.1
Alkaid	153 20.4	N49 25.8
Al Na'ir	28 17.1	S47 04.0
Alnilam	276 13.9	S 1 12.9
Alphard	218 22.9	S 8 33.7
Alphecca	126 33.9	N26 47.7
Alpheratz	358 11.1	N28 58.1
Altair	62 34.2	N 8 48.8
Ankaa	353 42.0	S42 25.4
Antares	112 59.3	S26 22.9
Arcturus	146 20.5	N19 18.1
Atria	108 25.2	S68 59.4
Avior	234 29.6	S59 26.2
Bellatrix	279 01.1	N 6 19.8
Betelgeuse	271 30.7	N 7 24.2
Canopus	264 08.4	S52 40.9
Capella	281 14.5	N45 58.3
Deneb	49 49.4	N45 12.3
Denebola	183 01.4	N14 41.9
Diphda	349 22.7	S18 06.4
Dubhe	194 25.4	N61 52.4
Elnath	278 46.9	N28 35.2
Eltanin	90 58.4	N51 29.9
Enif	34 13.3	N 9 46.5
Fomalhaut	15 53.4	S29 44.2
Gacrux	172 31.4	S56 59.4
Gienah	176 20.3	S17 25.1
Hadar	149 26.5	S60 16.1
Hamal	328 31.1	N23 21.4
Kaus Aust.	84 19.3	S34 23.7
Kochab	137 19.3	N74 15.2
Markab	14 04.9	N15 05.2
Menkar	314 43.2	N 4 00.2
Menkent	148 39.6	S36 15.7
Miaplacidus	221 46.2	S69 37.5
Mirfak	309 18.9	N49 46.7
Nunki	76 31.5	S26 19.4
Peacock	54 01.1	S56 48.4
Pollux	244 01.0	N28 04.8
Procyon	245 28.2	N 5 17.0
Rasalhague	96 31.3	N12 34.8
Regulus	208 12.5	N12 04.6
Rigel	281 38.1	S 8 13.6
Rigil Kent.	140 28.7	S60 44.7
Sabik	102 43.4	S15 41.7
Schedar	350 10.8	N56 24.8
Shaula	96 58.4	S37 05.3
Sirius	258 57.8	S16 41.1
Spica	158 59.9	S11 02.6
Suhail	223 12.7	S43 20.5
Vega	80 56.9	N38 46.1
Zuben'ubi	137 35.4	S15 56.9

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	247 24.3	9 34
Mars	277 33.1	7 33
Jupiter	269 54.8	8 02
Saturn	215 53.6	11 38

	G.M.T.	SUN		MOON				
		G.H.A.	Dec.	G.H.A.	v	Dec.	d	H.P.
	d h	° ′	° ′	° ′	′	° ′	′	′
	20 00	179 07.8	N12 33.4	119 38.1	9.4	S10 23.4	9.3	58.6
	01	194 08.0	32.6	134 06.5	9.4	10 32.7	9.1	58.6
	02	209 08.1	31.8	148 34.9	9.3	10 41.8	9.1	58.7
	03	224 08.3	· · 31.0	163 03.2	9.3	10 50.9	9.1	58.7
	04	239 08.4	30.2	177 31.5	9.3	11 00.0	9.0	58.7
	05	254 08.6	29.3	191 59.8	9.2	11 09.0	8.9	58.7
	06	269 08.7	N12 28.5	206 28.0	9.1	S11 17.9	8.9	58.7
	07	284 08.9	27.7	220 56.1	9.1	11 26.8	8.8	58.7
S	08	299 09.0	26.9	235 24.2	9.1	11 35.6	8.7	58.7
A	09	314 09.2	· · 26.0	249 52.3	9.0	11 44.3	8.7	58.8
T	10	329 09.3	25.2	264 20.3	8.9	11 53.0	8.6	58.8
U	11	344 09.5	24.4	278 48.2	8.9	12 01.6	8.5	58.8
R	12	359 09.6	N12 23.6	293 16.1	8.8	S12 10.1	8.5	58.8
D	13	14 09.8	22.7	307 43.9	8.8	12 18.6	8.4	58.8
A	14	29 09.9	21.9	322 11.7	8.7	12 27.0	8.3	58.8
Y	15	44 10.0	· · 21.1	336 39.4	8.7	12 35.3	8.3	58.8
	16	59 10.2	20.3	351 07.1	8.7	12 43.6	8.1	58.9
	17	74 10.3	19.4	5 34.8	8.5	12 51.7	8.2	58.9
	18	89 10.5	N12 18.6	20 02.3	8.6	S12 59.9	8.0	58.9
	19	104 10.6	17.8	34 29.9	8.5	13 07.9	8.0	58.9
	20	119 10.8	16.9	48 57.4	8.4	13 15.9	7.8	58.9
	21	134 10.9	· · 16.1	63 24.8	8.3	13 23.7	7.8	58.9
	22	149 11.1	15.3	77 52.1	8.4	13 31.5	7.8	58.9
	23	164 11.3	14.5	92 19.5	8.2	13 39.3	7.6	58.9
	21 00	179 11.4	N12 13.6	106 46.7	8.3	S13 46.9	7.6	59.0
	01	194 11.6	12.8	121 14.0	8.1	13 54.5	7.5	59.0
	02	209 11.7	12.0	135 41.1	8.1	14 02.0	7.4	59.0
	03	224 11.9	· · 11.1	150 08.2	8.1	14 09.4	7.3	59.0
	04	239 12.0	10.3	164 35.3	8.0	14 16.7	7.2	59.0
	05	254 12.2	09.5	179 02.3	8.0	14 23.9	7.2	59.0
	06	269 12.3	N12 08.7	193 29.3	7.9	S14 31.1	7.1	59.0
	07	284 12.5	07.8	207 56.2	7.8	14 38.2	6.9	59.0
	08	299 12.6	07.0	222 23.0	7.8	14 45.1	6.9	59.0
S	09	314 12.8	· · 06.2	236 49.8	7.8	14 52.0	6.8	59.1
U	10	329 12.9	05.3	251 16.6	7.7	14 58.8	6.7	59.1
N	11	344 13.1	04.5	265 43.3	7.6	15 05.5	6.7	59.1
D	12	359 13.2	N12 03.7	280 09.9	7.6	S15 12.2	6.5	59.1
A	13	14 13.4	02.8	294 36.5	7.6	15 18.7	6.4	59.1
Y	14	29 13.5	02.0	309 03.1	7.5	15 25.1	6.3	59.1
	15	44 13.7	· · 01.2	323 29.6	7.4	15 31.4	6.3	59.1
	16	59 13.9	12 00.3	337 56.0	7.4	15 37.7	6.1	59.1
	17	74 14.0	11 59.5	352 22.4	7.4	15 43.8	6.1	59.1
	18	89 14.2	N11 58.6	6 48.8	7.3	S15 49.9	5.9	59.2
	19	104 14.3	57.8	21 15.1	7.3	15 55.8	5.9	59.2
	20	119 14.5	57.0	35 41.4	7.2	16 01.7	5.8	59.2
	21	134 14.6	· · 56.1	50 07.6	7.1	16 07.5	5.6	59.2
	22	149 14.8	55.3	64 33.7	7.2	16 13.1	5.6	59.2
	23	164 14.9	54.5	78 59.9	7.0	16 18.7	5.4	59.2
	22 00	179 15.1	N11 53.6	93 25.9	7.1	S16 24.1	5.4	59.2
	01	194 15.3	52.8	107 52.0	7.0	16 29.5	5.2	59.2
	02	209 15.4	52.0	122 18.0	6.9	16 34.7	5.1	59.2
	03	224 15.6	· · 51.1	136 43.9	6.9	16 39.8	5.1	59.2
	04	239 15.7	50.3	151 09.8	6.8	16 44.9	4.9	59.3
	05	254 15.9	49.4	165 35.6	6.8	16 49.8	4.8	59.3
	06	269 16.0	N11 48.6	180 01.4	6.8	S16 54.6	4.8	59.3
	07	284 16.2	47.8	194 27.2	6.7	16 59.4	4.6	59.3
	08	299 16.4	46.9	208 52.9	6.7	17 04.0	4.5	59.3
M	09	314 16.5	· · 46.1	223 18.6	6.7	17 08.5	4.4	59.3
O	10	329 16.7	45.2	237 44.3	6.6	17 12.9	4.2	59.3
N	11	344 16.8	44.4	252 09.9	6.5	17 17.1	4.2	59.3
D	12	359 17.0	N11 43.6	266 35.4	6.6	S17 21.3	4.1	59.3
A	13	14 17.1	42.7	281 01.0	6.4	17 25.4	3.9	59.3
Y	14	29 17.3	41.9	295 26.4	6.5	17 29.3	3.8	59.3
	15	44 17.5	· · 41.0	309 51.9	6.4	17 33.1	3.7	59.4
	16	59 17.6	40.2	324 17.3	6.4	17 36.8	3.7	59.4
	17	74 17.8	39.3	338 42.7	6.3	17 40.5	3.4	59.4
	18	89 17.9	N11 38.5	353 08.0	6.3	S17 43.9	3.4	59.4
	19	104 18.1	37.7	7 33.3	6.3	17 47.3	3.3	59.4
	20	119 18.3	36.8	21 58.6	6.3	17 50.6	3.1	59.4
	21	134 18.4	· · 36.0	36 23.9	6.2	17 53.7	3.0	59.4
	22	149 18.6	35.1	50 49.1	6.2	17 56.7	2.9	59.4
	23	164 18.7	34.3	65 14.3	6.1	17 59.6	2.8	59.4
		S.D. 15.8	d 0.8	S.D.	16.0	16.1		16.2

Lat.	Twilight		Sunrise	Moonrise			
	Naut.	Civil		20	21	22	23
°	h m	h m	h m	h m	h m	h m	h m
N 72	////	////	03 01	13 22	15 27	18 01	■
N 70	////	01 43	03 25	12 59	14 47	16 32	17 57
68	////	02 23	03 43	12 40	14 20	15 52	17 09
66	////	02 50	03 58	12 26	13 59	15 25	16 38
64	01 30	03 10	04 09	12 14	13 42	15 04	16 15
62	02 06	03 26	04 19	12 04	13 29	14 48	15 57
60	02 31	03 39	04 28	11 56	13 17	14 34	15 41
N 58	02 50	03 51	04 36	11 48	13 07	14 22	15 29
56	03 05	04 00	04 42	11 42	12 59	14 11	15 17
54	03 18	04 09	04 48	11 36	12 51	14 02	15 08
52	03 29	04 16	04 53	11 31	12 44	13 54	14 59
50	03 39	04 23	04 58	11 26	12 38	13 47	14 51
45	03 59	04 37	05 08	11 16	12 24	13 31	14 35
N 40	04 14	04 48	05 17	11 07	12 13	13 19	14 21
35	04 26	04 58	05 24	11 00	12 04	13 08	14 09
30	04 36	05 06	05 31	10 53	11 56	12 58	13 59
20	04 52	05 19	05 42	10 43	11 42	12 42	13 42
N 10	05 04	05 29	05 51	10 33	11 30	12 28	13 27
0	05 14	05 39	06 00	10 24	11 18	12 15	13 13
S 10	05 22	05 47	06 08	10 15	11 07	12 02	12 59
20	05 29	05 55	06 18	10 06	10 55	11 48	12 44
30	05 35	06 03	06 28	09 55	10 41	11 32	12 27
35	05 38	06 08	06 34	09 49	10 34	11 23	12 17
40	05 41	06 13	06 40	09 42	10 25	11 12	12 05
45	05 44	06 18	06 48	09 34	10 14	11 00	11 52
S 50	05 46	06 24	06 57	09 25	10 02	10 45	11 36
52	05 47	06 27	07 01	09 20	09 56	10 38	11 28
54	05 48	06 29	07 06	09 15	09 49	10 30	11 20
56	05 49	06 33	07 11	09 10	09 42	10 22	11 10
58	05 50	06 36	07 17	09 04	09 34	10 12	11 00
S 60	05 51	06 40	07 23	08 57	09 25	10 01	10 47

Lat.	Sunset	Twilight		Moonset			
		Civil	Naut.	20	21	22	23
°	h m	h m	h m	h m	h m	h m	h m
N 72	21 00	23 38	////	19 35	19 25	18 50	■
N 70	20 38	22 16	////	20 00	20 06	20 20	20 56
68	20 20	21 39	////	20 20	20 34	20 59	21 44
66	20 06	21 13	23 42	20 35	20 55	21 27	22 15
64	19 55	20 54	22 29	20 48	21 13	21 48	22 38
62	19 45	20 38	21 56	20 58	21 27	22 05	22 57
60	19 36	20 25	21 32	21 08	21 39	22 19	23 12
N 58	19 29	20 14	21 14	21 16	21 49	22 31	23 25
56	19 23	20 04	20 59	21 23	21 58	22 42	23 36
54	19 17	19 56	20 46	21 29	22 06	22 51	23 46
52	19 12	19 49	20 35	21 35	22 14	23 00	23 54
50	19 07	19 42	20 26	21 40	22 20	23 07	24 02
45	18 57	19 28	20 06	21 52	22 34	23 23	24 19
N 40	18 49	19 17	19 51	22 01	22 46	23 36	24 33
35	18 41	19 08	19 39	22 09	22 56	23 47	24 44
30	18 35	19 00	19 29	22 16	23 05	23 57	24 54
20	18 24	18 47	19 14	22 29	23 20	24 14	00 14
N 10	18 15	18 37	19 02	22 40	23 33	24 29	00 29
0	18 06	18 28	18 52	22 50	23 45	24 42	00 42
S 10	17 58	18 19	18 44	23 00	23 57	24 56	00 56
20	17 49	18 11	18 37	23 11	24 11	00 11	01 11
30	17 39	18 03	18 31	23 23	24 26	00 26	01 28
35	17 33	17 59	18 29	23 30	24 35	00 35	01 37
40	17 27	17 54	18 26	23 39	24 45	00 45	01 48
45	17 19	17 49	18 23	23 48	24 56	00 56	02 02
S 50	17 10	17 43	18 21	24 00	00 00	01 11	02 18
52	17 06	17 41	18 20	24 05	00 05	01 17	02 25
54	17 01	17 38	18 19	24 11	00 11	01 25	02 33
56	16 56	17 35	18 18	24 18	00 18	01 33	02 43
58	16 50	17 31	18 17	24 25	00 25	01 42	02 53
S 60	16 44	17 28	18 16	24 34	00 34	01 53	03 06

Day	SUN			MOON			
	Eqn. of Time 00ʰ	Eqn. of Time 12ʰ	Mer. Pass.	Mer. Pass. Upper	Mer. Pass. Lower	Age	Phase
	m s	m s	h m	h m	h m	d	
20	03 29	03 22	12 03	16 37	04 10	06	◐
21	03 15	03 07	12 03	17 32	05 04	07	
22	03 00	02 52	12 03	18 29	06 00	08	

1977 AUGUST 23, 24, 25 (TUES., WED., THURS.)

G.M.T.		ARIES	VENUS −3.5		MARS +1.1		JUPITER −1.7		SATURN +0.7	
		G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
d	h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
23	00	331 10.3	216 04.9	N20 45.6	247 20.2	N23 11.9	240 43.3	N23 02.1	186 48.9	N15 15.9
	01	346 12.8	231 04.2	45.2	262 20.9	12.0	255 45.3	02.1	201 51.1	15.8
	02	1 15.3	246 03.5	44.8	277 21.7	12.1	270 47.3	02.1	216 53.2	15.7
	03	16 17.7	261 02.9	·· 44.5	292 22.4	·· 12.2	285 49.3	·· 02.1	231 55.4	·· 15.6
	04	31 20.2	276 02.2	44.1	307 23.1	12.3	300 51.3	02.1	246 57.5	15.5
	05	46 22.7	291 01.6	43.8	322 23.9	12.4	315 53.4	02.1	261 59.7	15.4
	06	61 25.1	306 00.9	N20 43.4	337 24.6	N23 12.5	330 55.4	N23 02.1	277 01.8	N15 15.3
	07	76 27.6	321 00.3	43.0	352 25.3	12.6	345 57.4	02.1	292 04.0	15.2
	08	91 30.1	335 59.6	42.7	7 26.1	12.7	0 59.4	02.1	307 06.1	15.1
TUESDAY	09	106 32.5	350 59.0	·· 42.3	22 26.8	·· 12.8	16 01.4	·· 02.1	322 08.3	·· 15.0
	10	121 35.0	5 58.3	42.0	37 27.5	12.9	31 03.4	02.1	337 10.4	14.9
	11	136 37.4	20 57.6	41.6	52 28.3	13.0	46 05.4	02.1	352 12.6	14.8
	12	151 39.9	35 57.0	N20 41.2	67 29.0	N23 13.1	61 07.5	N23 02.1	7 14.7	N15 14.7
	13	166 42.4	50 56.3	40.9	82 29.7	13.3	76 09.5	02.1	22 16.9	14.6
	14	181 44.8	65 55.7	40.5	97 30.5	13.4	91 11.5	02.1	37 19.0	14.5
	15	196 47.3	80 55.0	·· 40.1	112 31.2	·· 13.5	106 13.5	·· 02.1	52 21.2	·· 14.4
	16	211 49.8	95 54.4	39.8	127 31.9	13.6	121 15.5	02.1	67 23.3	14.3
	17	226 52.2	110 53.7	39.4	142 32.7	13.7	136 17.5	02.1	82 25.5	14.2
	18	241 54.7	125 53.1	N20 39.0	157 33.4	N23 13.8	151 19.6	N23 02.1	97 27.6	N15 14.1
	19	256 57.2	140 52.4	38.6	172 34.2	13.9	166 21.6	02.1	112 29.8	14.0
	20	271 59.6	155 51.8	38.3	187 34.9	14.0	181 23.6	02.1	127 31.9	13.9
	21	287 02.1	170 51.1	·· 37.9	202 35.6	·· 14.1	196 25.6	·· 02.1	142 34.1	·· 13.8
	22	302 04.6	185 50.5	37.5	217 36.4	14.2	211 27.6	02.1	157 36.2	13.7
	23	317 07.0	200 49.8	37.1	232 37.1	14.3	226 29.6	02.1	172 38.4	13.6
24	00	332 09.5	215 49.1	N20 36.8	247 37.8	N23 14.4	241 31.7	N23 02.1	187 40.6	N15 13.5
	01	347 11.9	230 48.5	36.4	262 38.6	14.5	256 33.7	02.1	202 42.7	13.4
	02	2 14.4	245 47.8	36.0	277 39.3	14.6	271 35.7	02.1	217 44.9	13.3
	03	17 16.9	260 47.2	·· 35.6	292 40.1	·· 14.7	286 37.7	·· 02.1	232 47.0	·· 13.2
	04	32 19.3	275 46.5	35.2	307 40.8	14.8	301 39.7	02.1	247 49.2	13.1
	05	47 21.8	290 45.9	34.8	322 41.5	14.9	316 41.8	02.1	262 51.3	13.0
	06	62 24.3	305 45.2	N20 34.5	337 42.3	N23 15.0	331 43.8	N23 02.1	277 53.5	N15 12.9
WEDNESDAY	07	77 26.7	320 44.6	34.1	352 43.0	15.1	346 45.8	02.1	292 55.6	12.8
	08	92 29.2	335 43.9	33.7	7 43.8	15.2	1 47.8	02.1	307 57.8	12.7
	09	107 31.7	350 43.3	·· 33.3	22 44.5	·· 15.3	16 49.8	·· 02.1	322 59.9	·· 12.6
	10	122 34.1	5 42.6	32.9	37 45.2	15.4	31 51.9	02.1	338 02.1	12.5
	11	137 36.6	20 42.0	32.5	52 46.0	15.5	46 53.9	02.1	353 04.2	12.5
	12	152 39.1	35 41.3	N20 32.1	67 46.7	N23 15.6	61 55.9	N23 02.1	8 06.4	N15 12.4
	13	167 41.5	50 40.7	31.7	82 47.5	15.7	76 57.9	02.1	23 08.5	12.3
	14	182 44.0	65 40.0	31.4	97 48.2	15.8	91 59.9	02.1	38 10.7	12.2
	15	197 46.4	80 39.4	·· 31.0	112 48.9	·· 15.9	107 02.0	·· 02.1	53 12.8	·· 12.1
	16	212 48.9	95 38.7	30.6	127 49.7	16.0	122 04.0	02.1	68 15.0	12.0
	17	227 51.4	110 38.1	30.2	142 50.4	16.1	137 06.0	02.1	83 17.1	11.9
	18	242 53.8	125 37.4	N20 29.8	157 51.2	N23 16.2	152 08.0	N23 02.1	98 19.3	N15 11.8
	19	257 56.3	140 36.7	29.4	172 51.9	16.3	167 10.0	02.1	113 21.4	11.7
	20	272 58.8	155 36.1	29.0	187 52.6	16.4	182 12.1	02.1	128 23.6	11.6
	21	288 01.2	170 35.4	·· 28.6	202 53.4	·· 16.5	197 14.1	·· 02.1	143 25.7	·· 11.5
	22	303 03.7	185 34.8	28.2	217 54.1	16.6	212 16.1	02.1	158 27.9	11.4
	23	318 06.2	200 34.1	27.8	232 54.9	16.7	227 18.1	02.1	173 30.0	11.3
25	00	333 08.6	215 33.5	N20 27.4	247 55.6	N23 16.8	242 20.2	N23 02.1	188 32.2	N15 11.2
	01	348 11.1	230 32.8	27.0	262 56.4	16.8	257 22.2	02.1	203 34.3	11.1
	02	3 13.5	245 32.2	26.6	277 57.1	16.9	272 24.2	02.1	218 36.5	11.0
	03	18 16.0	260 31.5	·· 26.2	292 57.8	·· 17.0	287 26.2	·· 02.1	233 38.7	·· 10.9
	04	33 18.5	275 30.9	25.8	307 58.6	17.1	302 28.3	02.1	248 40.8	10.8
	05	48 20.9	290 30.2	25.4	322 59.3	17.2	317 30.3	02.1	263 43.0	10.7
	06	63 23.4	305 29.6	N20 24.9	338 00.1	N23 17.3	332 32.3	N23 02.1	278 45.1	N15 10.6
	07	78 25.9	320 28.9	24.5	353 00.8	17.4	347 34.3	02.1	293 47.3	10.5
THURSDAY	08	93 28.3	335 28.3	24.1	8 01.6	17.5	2 36.3	02.1	308 49.4	10.4
	09	108 30.8	350 27.6	·· 23.7	23 02.3	·· 17.6	17 38.4	·· 02.1	323 51.6	·· 10.3
	10	123 33.3	5 27.0	23.3	38 03.0	17.7	32 40.4	02.1	338 53.7	10.2
	11	138 35.7	20 26.3	22.9	53 03.8	17.8	47 42.4	02.1	353 55.9	10.1
	12	153 38.2	35 25.7	N20 22.5	68 04.5	N23 17.9	62 44.4	N23 02.1	8 58.0	N15 10.0
	13	168 40.7	50 25.0	22.1	83 05.3	18.0	77 46.5	02.1	24 00.2	09.9
	14	183 43.1	65 24.4	21.6	98 06.0	18.0	92 48.5	02.1	39 02.3	09.8
	15	198 45.6	80 23.7	·· 21.2	113 06.8	·· 18.1	107 50.5	·· 02.1	54 04.5	·· 09.7
	16	213 48.0	95 23.1	20.8	128 07.5	18.2	122 52.6	02.1	69 06.6	09.6
	17	228 50.5	110 22.4	20.4	143 08.3	18.3	137 54.6	02.1	84 08.8	09.5
	18	243 53.0	125 21.8	N20 20.0	158 09.0	N23 18.4	152 56.6	N23 02.1	99 10.9	N15 09.4
	19	258 55.4	140 21.1	19.5	173 09.8	18.5	167 58.6	02.1	114 13.1	09.3
	20	273 57.9	155 20.5	19.1	188 10.5	18.6	183 00.7	02.1	129 15.2	09.2
	21	289 00.4	170 19.8	·· 18.7	203 11.2	·· 18.7	198 02.7	·· 02.1	144 17.4	·· 09.1
	22	304 02.8	185 19.2	18.3	218 12.0	18.8	213 04.7	02.1	159 19.5	09.0
	23	319 05.3	200 18.5	17.9	233 12.7	18.8	228 06.7	02.1	174 21.7	08.9
Mer. Pass.		h m 1 51.1	v −0.7	d 0.4	v 0.7	d 0.1	v 2.0	d 0.0	v 2.2	d 0.1

STARS		
Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 38.7	S40 23.4
Achernar	335 46.5	S57 20.7
Acrux	173 40.0	S62 58.7
Adhara	255 34.0	S28 56.4
Aldebaran	291 20.4	N16 27.8
Alioth	166 44.8	N56 05.1
Alkaid	153 20.4	N49 25.8
Al Na'ir	28 17.1	S47 04.0
Alnilam	276 13.9	S 1 12.9
Alphard	218 22.9	S 8 33.7
Alphecca	126 33.9	N26 47.7
Alpheratz	358 11.1	N28 58.1
Altair	62 34.2	N 8 48.8
Ankaa	353 42.0	S42 25.4
Antares	112 59.3	S26 22.9
Arcturus	146 20.5	N19 18.1
Atria	108 25.2	S68 59.4
Avior	234 29.5	S59 26.2
Bellatrix	279 01.1	N 6 19.8
Betelgeuse	271 30.7	N 7 24.2
Canopus	264 08.4	S52 40.9
Capella	281 14.5	N45 58.3
Deneb	49 49.4	N45 12.3
Denebola	183 01.4	N14 41.9
Diphda	349 22.7	S18 06.4
Dubhe	194 25.4	N61 52.4
Elnath	278 46.9	N28 35.2
Eltanin	90 58.4	N51 29.9
Enif	34 13.3	N 9 46.6
Fomalhaut	15 53.4	S29 44.2
Gacrux	172 31.4	S56 59.4
Gienah	176 20.3	S17 25.0
Hadar	149 26.5	S60 16.1
Hamal	328 31.0	N23 21.4
Kaus Aust.	84 19.3	S34 23.7
Kochab	137 19.4	N74 15.2
Markab	14 04.9	N15 05.3
Menkar	314 43.2	N 4 00.2
Menkent	148 39.6	S36 15.7
Miaplacidus	221 46.2	S69 37.5
Mirfak	309 18.9	N49 46.7
Nunki	76 31.5	S26 19.4
Peacock	54 01.1	S56 48.4
Pollux	244 01.0	N28 04.8
Procyon	245 28.2	N 5 17.0
Rasalhague	96 31.4	N12 34.8
Regulus	208 12.5	N12 04.6
Rigel	281 38.1	S 8 13.6
Rigil Kent.	140 28.7	S60 44.7
Sabik	102 43.4	S15 41.7
Schedar	350 10.8	N56 24.8
Shaula	96 58.4	S37 05.3
Sirius	258 57.7	S16 41.1
Spica	158 59.9	S11 02.6
Suhail	223 12.7	S43 20.5
Vega	80 57.0	N38 46.1
Zuben'ubi	137 35.4	S15 56.9

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	243 39.7	9 37
Mars	275 28.4	7 29
Jupiter	269 22.2	7 53
Saturn	215 31.1	11 28

	G.M.T.	SUN G.H.A.	SUN Dec.	MOON G.H.A.	v	MOON Dec.	d	H.P.
d	h	° ′	° ′	° ′	′	° ′	′	′
23	00	179 18.9	N11 33.4	79 39.4	6.2	S18 02.4	2.7	59.4
	01	194 19.1	32.6	94 04.6	6.1	18 05.1	2.5	59.4
	02	209 19.2	31.7	108 29.7	6.1	18 07.6	2.5	59.4
	03	224 19.4	·· 30.9	122 54.8	6.0	18 10.1	2.3	59.4
	04	239 19.6	30.1	137 19.8	6.0	18 12.4	2.2	59.4
	05	254 19.7	29.2	151 44.8	6.0	18 14.6	2.1	59.4
	06	269 19.9	N11 28.4	166 09.8	6.0	S18 16.7	1.9	59.4
	07	284 20.0	27.5	180 34.8	6.0	18 18.6	1.8	59.5
	08	299 20.2	26.7	194 59.8	5.9	18 20.4	1.7	59.5
T	09	314 20.4	·· 25.8	209 24.7	5.9	18 22.1	1.6	59.5
U	10	329 20.5	25.0	223 49.6	5.9	18 23.7	1.5	59.5
E	11	344 20.7	24.1	238 14.5	5.9	18 25.2	1.3	59.5
S	12	359 20.9	N11 23.3	252 39.4	5.9	S18 26.5	1.2	59.5
D	13	14 21.0	22.4	267 04.3	5.8	18 27.7	1.1	59.5
A	14	29 21.2	21.6	281 29.1	5.9	18 28.8	1.0	59.5
Y	15	44 21.3	·· 20.7	295 54.0	5.8	18 29.8	0.8	59.5
	16	59 21.5	19.9	310 18.8	5.8	18 30.6	0.8	59.5
	17	74 21.7	19.0	324 43.6	5.8	18 31.4	0.6	59.5
	18	89 21.8	N11 18.2	339 08.4	5.8	S18 32.0	0.4	59.5
	19	104 22.0	17.3	353 33.2	5.8	18 32.4	0.4	59.5
	20	119 22.2	16.5	7 58.0	5.8	18 32.8	0.2	59.5
	21	134 22.3	·· 15.6	22 22.8	5.7	18 33.0	0.1	59.5
	22	149 22.5	14.8	36 47.5	5.8	18 33.1	0.0	59.5
	23	164 22.7	13.9	51 12.3	5.8	18 33.1	0.2	59.5
24	00	179 22.8	N11 13.1	65 37.1	5.7	S18 32.9	0.3	59.5
	01	194 23.0	12.2	80 01.8	5.8	18 32.6	0.3	59.5
	02	209 23.2	11.4	94 26.6	5.7	18 32.3	0.6	59.5
	03	224 23.3	·· 10.5	108 51.3	5.8	18 31.7	0.6	59.5
	04	239 23.5	09.7	123 16.1	5.7	18 31.1	0.8	59.5
	05	254 23.7	08.8	137 40.8	5.8	18 30.3	0.9	59.5
	06	269 23.8	N11 07.9	152 05.6	5.8	S18 29.4	1.0	59.5
W	07	284 24.0	07.1	166 30.4	5.7	18 28.4	1.2	59.5
E	08	299 24.2	06.2	180 55.1	5.8	18 27.2	1.2	59.5
D	09	314 24.3	·· 05.4	195 19.9	5.8	18 26.0	1.4	59.5
N	10	329 24.5	04.5	209 44.7	5.8	18 24.6	1.5	59.5
E	11	344 24.7	03.7	224 09.5	5.8	18 23.1	1.7	59.5
S	12	359 24.8	N11 02.8	238 34.3	5.8	S18 21.4	1.7	59.5
D	13	14 25.0	02.0	252 59.1	5.8	18 19.7	1.9	59.5
A	14	29 25.2	01.1	267 23.9	5.8	18 17.8	2.0	59.5
Y	15	44 25.3	11 00.2	281 48.7	5.9	18 15.8	2.2	59.5
	16	59 25.5	10 59.4	296 13.6	5.8	18 13.6	2.2	59.5
	17	74 25.7	58.5	310 38.4	5.9	18 11.4	2.4	59.5
	18	89 25.8	N10 57.7	325 03.3	5.9	S18 09.0	2.5	59.5
	19	104 26.0	56.8	339 28.2	5.9	18 06.5	2.6	59.5
	20	119 26.2	56.0	353 53.1	6.0	18 03.9	2.7	59.5
	21	134 26.4	·· 55.1	8 18.1	5.9	18 01.2	2.9	59.5
	22	149 26.5	54.2	22 43.0	6.0	17 58.3	3.0	59.5
	23	164 26.7	53.4	37 08.0	6.0	17 55.3	3.1	59.5
25	00	179 26.9	N10 52.5	51 33.0	6.0	S17 52.2	3.2	59.5
	01	194 27.0	51.7	65 58.0	6.1	17 49.0	3.3	59.5
	02	209 27.2	50.8	80 23.1	6.1	17 45.7	3.5	59.5
	03	224 27.4	·· 49.9	94 48.2	6.1	17 42.2	3.6	59.5
	04	239 27.5	49.1	109 13.3	6.1	17 38.6	3.6	59.5
	05	254 27.7	48.2	123 38.4	6.2	17 35.0	3.8	59.5
	06	269 27.9	N10 47.3	138 03.6	6.1	S17 31.2	4.0	59.5
	07	284 28.1	46.5	152 28.7	6.3	17 27.2	4.0	59.5
T	08	299 28.2	45.6	166 54.0	6.2	17 23.2	4.1	59.5
H	09	314 28.4	·· 44.8	181 19.2	6.3	17 19.1	4.3	59.5
U	10	329 28.6	43.9	195 44.5	6.3	17 14.8	4.4	59.5
R	11	344 28.8	43.0	210 09.8	6.4	17 10.4	4.5	59.4
S	12	359 28.9	N10 42.2	224 35.2	6.4	S17 05.9	4.6	59.4
D	13	14 29.1	41.3	239 00.6	6.4	17 01.3	4.7	59.4
A	14	29 29.3	40.4	253 26.0	6.4	16 56.6	4.8	59.4
Y	15	44 29.4	·· 39.6	267 51.4	6.5	16 51.8	4.9	59.4
	16	59 29.6	38.7	282 16.9	6.6	16 46.9	5.1	59.4
	17	74 29.8	37.9	296 42.5	6.5	16 41.8	5.1	59.4
	18	89 30.0	N10 37.0	311 08.0	6.7	S16 36.7	5.3	59.4
	19	104 30.1	36.1	325 33.7	6.6	16 31.4	5.3	59.4
	20	119 30.3	35.3	339 59.3	6.7	16 26.1	5.5	59.4
	21	134 30.5	·· 34.4	354 25.0	6.8	16 20.6	5.5	59.4
	22	149 30.7	33.5	8 50.8	6.7	16 15.1	5.7	59.4
	23	164 30.8	32.7	23 16.5	6.9	16 09.4	5.8	59.4
		S.D. 15.8	*d* 0.9	S.D. 16.2		16.2		16.2

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 23	Moonrise 24	Moonrise 25	Moonrise 26
°	h m	h m	h m	h m	h m	h m	h m
N 72	////	01 12	03 19	■	■	19 46	19 34
N 70	////	02 07	03 39	17 57	18 42	18 59	19 06
68	////	02 40	03 55	17 09	18 00	18 29	18 45
66	01 02	03 03	04 08	16 38	17 31	18 06	18 29
64	01 51	03 21	04 18	16 15	17 09	17 48	18 15
62	02 21	03 35	04 28	15 57	16 52	17 33	18 04
60	02 42	03 48	04 35	15 41	16 37	17 20	17 54
N 58	03 00	03 58	04 42	15 29	16 25	17 10	17 45
56	03 14	04 07	04 48	15 17	16 14	17 00	17 37
54	03 26	04 15	04 53	15 08	16 04	16 52	17 31
52	03 36	04 22	04 58	14 59	15 56	16 44	17 25
50	03 45	04 28	05 03	14 51	15 48	16 37	17 19
45	04 03	04 41	05 12	14 35	15 32	16 23	17 07
N 40	04 17	04 52	05 20	14 21	15 19	16 11	16 57
35	04 29	05 00	05 27	14 09	15 07	16 00	16 49
30	04 38	05 08	05 32	13 59	14 57	15 51	16 41
20	04 53	05 20	05 42	13 42	14 40	15 36	16 28
N 10	05 05	05 30	05 51	13 27	14 25	15 22	16 17
0	05 13	05 38	05 59	13 13	14 12	15 10	16 06
S 10	05 21	05 46	06 07	12 59	13 58	14 57	15 55
20	05 27	05 53	06 15	12 44	13 43	14 43	15 44
30	05 32	06 00	06 25	12 27	13 26	14 28	15 31
35	05 35	06 04	06 30	12 17	13 16	14 19	15 23
40	05 37	06 08	06 36	12 05	13 05	14 08	15 15
45	05 39	06 13	06 43	11 52	12 51	13 56	15 04
S 50	05 41	06 18	06 51	11 36	12 35	13 41	14 52
52	05 41	06 20	06 55	11 28	12 28	13 34	14 47
54	05 42	06 23	06 59	11 20	12 19	13 27	14 40
56	05 42	06 26	07 04	11 10	12 10	13 18	14 33
58	05 43	06 29	07 09	11 00	11 59	13 08	14 25
S 60	05 43	06 32	07 15	10 47	11 46	12 57	14 16

Lat.	Sunset	Twilight Civil	Twilight Naut.	Moonset 23	Moonset 24	Moonset 25	Moonset 26
°	h m	h m	h m	h m	h m	h m	h m
N 72	20 42	22 40	////	■	■	23 11	25 20
N 70	20 22	21 51	////	20 56	22 14	23 57	25 46
68	20 07	21 21	////	21 44	22 56	24 27	00 27
66	19 54	20 58	22 51	22 15	23 24	24 49	00 49
64	19 44	20 41	22 08	22 38	23 46	25 06	01 06
62	19 35	20 27	21 40	22 57	24 03	00 03	01 21
60	19 28	20 15	21 19	23 12	24 17	00 17	01 33
N 58	19 21	20 05	21 03	23 25	24 29	00 29	01 43
56	19 15	19 56	20 49	23 36	24 40	00 40	01 52
54	19 10	19 48	20 37	23 46	24 49	00 49	02 00
52	19 05	19 42	20 27	23 54	24 58	00 58	02 08
50	19 01	19 36	20 18	24 02	00 02	01 05	02 14
45	18 52	19 23	20 00	24 19	00 19	01 21	02 28
N 40	18 44	19 12	19 46	24 33	00 33	01 34	02 39
35	18 38	19 04	19 35	24 44	00 44	01 45	02 49
30	18 32	18 57	19 26	24 54	00 54	01 55	02 58
20	18 22	18 45	19 11	00 14	01 12	02 11	03 12
N 10	18 14	18 35	19 00	00 29	01 27	02 26	03 25
0	18 06	18 27	18 51	00 42	01 41	02 39	03 37
S 10	17 58	18 19	18 44	00 56	01 55	02 53	03 49
20	17 50	18 12	18 38	01 11	02 10	03 07	04 01
30	17 41	18 05	18 33	01 28	02 27	03 23	04 15
35	17 35	18 01	18 31	01 37	02 37	03 33	04 24
40	17 29	17 57	18 28	01 48	02 49	03 44	04 33
45	17 22	17 52	18 27	02 02	03 02	03 56	04 44
S 50	17 14	17 47	18 25	02 18	03 18	04 12	04 57
52	17 10	17 45	18 24	02 25	03 26	04 19	05 03
54	17 06	17 43	18 24	02 33	03 35	04 27	05 10
56	17 02	17 40	18 23	02 43	03 44	04 35	05 17
58	16 57	17 37	18 23	02 53	03 55	04 45	05 26
S 60	16 51	17 34	18 23	03 06	04 07	04 57	05 35

Day	SUN Eqn. of Time 00ʰ	SUN Eqn. of Time 12ʰ	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
	m s	m s	h m	h m	h m	d	
23	02 45	02 37	12 03	19 27	06 58	09	◐
24	02 29	02 21	12 02	20 25	07 56	10	
25	02 13	02 05	12 02	21 23	08 55	11	

G.M.T.	ARIES	VENUS −3.5		MARS +1.0		JUPITER −1.7		SATURN +0.7	
	G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
d h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
26 00	334 07.8	215 17.9	N20 17.4	248 13.5	N23 18.9	243 08.8	N23 02.1	189 23.9	N15 08.8
01	349 10.2	230 17.3	17.0	263 14.2	19.0	258 10.8	02.1	204 26.0	08.7
02	4 12.7	245 16.6	16.6	278 15.0	19.1	273 12.8	02.1	219 28.2	08.6
03	19 15.2	260 16.0	·· 16.1	293 15.7	·· 19.2	288 14.9	·· 02.1	234 30.3	·· 08.5
04	34 17.6	275 15.3	15.7	308 16.5	19.3	303 16.9	02.1	249 32.5	08.4
05	49 20.1	290 14.7	15.3	323 17.2	19.4	318 18.9	02.1	264 34.6	08.3
06	64 22.5	305 14.0	N20 14.9	338 18.0	N23 19.5	333 20.9	N23 02.1	279 36.8	N15 08.2
07	79 25.0	320 13.4	14.4	353 18.7	19.5	348 23.0	02.1	294 38.9	08.1
08	94 27.5	335 12.7	14.0	8 19.5	19.6	3 25.0	02.1	309 41.1	08.0
F 09	109 29.9	350 12.1	·· 13.6	23 20.2	·· 19.7	18 27.0	·· 02.1	324 43.2	·· 07.9
R 10	124 32.4	5 11.4	13.1	38 21.0	19.8	33 29.1	02.1	339 45.4	07.8
I 11	139 34.9	20 10.8	12.7	53 21.7	19.9	48 31.1	02.1	354 47.5	07.7
D 12	154 37.3	35 10.1	N20 12.2	68 22.5	N23 20.0	63 33.1	N23 02.1	9 49.7	N15 07.6
A 13	169 39.8	50 09.5	11.8	83 23.2	20.0	78 35.2	02.1	24 51.8	07.5
Y 14	184 42.3	65 08.8	11.4	98 24.0	20.1	93 37.2	02.1	39 54.0	07.4
15	199 44.7	80 08.2	·· 10.9	113 24.7	·· 20.2	108 39.2	·· 02.1	54 56.1	·· 07.3
16	214 47.2	95 07.5	10.5	128 25.5	20.3	123 41.2	02.1	69 58.3	07.2
17	229 49.6	110 06.9	10.0	143 26.2	20.4	138 43.3	02.1	85 00.5	07.1
18	244 52.1	125 06.3	N20 09.6	158 27.0	N23 20.5	153 45.3	N23 02.1	100 02.6	N15 07.0
19	259 54.6	140 05.6	09.1	173 27.7	20.5	168 47.3	02.1	115 04.8	06.9
20	274 57.0	155 05.0	08.7	188 28.5	20.6	183 49.4	02.1	130 06.9	06.8
21	289 59.5	170 04.3	·· 08.3	203 29.2	·· 20.7	198 51.4	·· 02.1	145 09.1	·· 06.7
22	305 02.0	185 03.7	07.8	218 30.0	20.8	213 53.4	02.1	160 11.2	06.6
23	320 04.4	200 03.0	07.4	233 30.7	20.9	228 55.5	02.1	175 13.4	06.5
27 00	335 06.9	215 02.4	N20 06.9	248 31.5	N23 20.9	243 57.5	N23 02.1	190 15.5	N15 06.4
01	350 09.4	230 01.7	06.5	263 32.2	21.0	258 59.5	02.1	205 17.7	06.3
02	5 11.8	245 01.1	06.0	278 33.0	21.1	274 01.6	02.1	220 19.8	06.2
03	20 14.3	260 00.4	·· 05.6	293 33.7	·· 21.2	289 03.6	·· 02.1	235 22.0	·· 06.1
04	35 16.8	274 59.8	05.1	308 34.5	21.3	304 05.6	02.1	250 24.1	06.0
05	50 19.2	289 59.2	04.6	323 35.2	21.3	319 07.7	02.1	265 26.3	05.9
06	65 21.7	304 58.5	N20 04.2	338 36.0	N23 21.4	334 09.7	N23 02.1	280 28.4	N15 05.8
07	80 24.1	319 57.9	03.7	353 36.7	21.5	349 11.7	02.1	295 30.6	05.7
S 08	95 26.6	334 57.2	03.3	8 37.5	21.6	4 13.8	02.1	310 32.8	05.6
A 09	110 29.1	349 56.6	·· 02.8	23 38.2	·· 21.6	19 15.8	·· 02.1	325 34.9	·· 05.5
T 10	125 31.5	4 55.9	02.4	38 39.0	21.7	34 17.8	02.1	340 37.1	05.4
U 11	140 34.0	19 55.3	01.9	53 39.7	21.8	49 19.9	02.1	355 39.2	05.3
R 12	155 36.5	34 54.6	N20 01.4	68 40.5	N23 21.9	64 21.9	N23 02.1	10 41.4	N15 05.2
D 13	170 38.9	49 54.0	01.0	83 41.3	22.0	79 24.0	02.1	25 43.5	05.1
A 14	185 41.4	64 53.4	00.5	98 42.0	22.0	94 26.0	02.1	40 45.7	05.0
Y 15	200 43.9	79 52.7	20 00.0	113 42.8	·· 22.1	109 28.0	·· 02.1	55 47.8	·· 04.9
16	215 46.3	94 52.1	19 59.6	128 43.5	22.2	124 30.1	02.1	70 50.0	04.8
17	230 48.8	109 51.4	59.1	143 44.3	22.3	139 32.1	02.1	85 52.1	04.7
18	245 51.3	124 50.8	N19 58.6	158 45.0	N23 22.3	154 34.1	N23 02.1	100 54.3	N15 04.6
19	260 53.7	139 50.1	58.2	173 45.8	22.4	169 36.2	02.1	115 56.4	04.5
20	275 56.2	154 49.5	57.7	188 46.5	22.5	184 38.2	02.1	130 58.6	04.4
21	290 58.6	169 48.9	·· 57.2	203 47.3	·· 22.6	199 40.2	·· 02.1	146 00.8	·· 04.3
22	306 01.1	184 48.2	56.8	218 48.1	22.6	214 42.3	02.1	161 02.9	04.2
23	321 03.6	199 47.6	56.3	233 48.8	22.7	229 44.3	02.1	176 05.1	04.1
28 00	336 06.0	214 46.9	N19 55.8	248 49.6	N23 22.8	244 46.4	N23 02.1	191 07.2	N15 04.0
01	351 08.5	229 46.3	55.4	263 50.3	22.8	259 48.4	02.1	206 09.4	03.9
02	6 11.0	244 45.7	54.9	278 51.1	22.9	274 50.4	02.1	221 11.5	03.8
03	21 13.4	259 45.0	·· 54.4	293 51.8	·· 23.0	289 52.5	·· 02.1	236 13.7	·· 03.7
04	36 15.9	274 44.4	53.9	308 52.6	23.1	304 54.5	02.1	251 15.8	03.6
05	51 18.4	289 43.7	53.4	323 53.3	23.1	319 56.6	02.1	266 18.0	03.5
06	66 20.8	304 43.1	N19 53.0	338 54.1	N23 23.2	334 58.6	N23 02.0	281 20.1	N15 03.4
07	81 23.3	319 42.5	52.5	353 54.9	23.3	350 00.6	02.0	296 22.3	03.3
08	96 25.7	334 41.8	52.0	8 55.6	23.3	5 02.7	02.0	311 24.4	03.2
S 09	111 28.2	349 41.2	·· 51.5	23 56.4	·· 23.4	20 04.7	·· 02.0	326 26.6	·· 03.1
U 10	126 30.7	4 40.5	51.0	38 57.1	23.5	35 06.8	02.0	341 28.8	03.0
N 11	141 33.1	19 39.9	50.6	53 57.9	23.6	50 08.8	02.0	356 30.9	02.9
D 12	156 35.6	34 39.3	N19 50.1	68 58.7	N23 23.6	65 10.8	N23 02.0	11 33.1	N15 02.9
A 13	171 38.1	49 38.6	49.6	83 59.4	23.7	80 12.9	02.0	26 35.2	02.8
Y 14	186 40.5	64 38.0	49.1	99 00.2	23.8	95 14.9	02.0	41 37.4	02.7
15	201 43.0	79 37.3	·· 48.6	114 00.9	·· 23.8	110 17.0	·· 02.0	56 39.5	·· 02.6
16	216 45.5	94 36.7	48.1	129 01.7	23.9	125 19.0	02.0	71 41.7	02.5
17	231 47.9	109 36.1	47.6	144 02.5	24.0	140 21.0	02.0	86 43.8	02.4
18	246 50.4	124 35.4	N19 47.1	159 03.2	N23 24.0	155 23.1	N23 02.0	101 46.0	N15 02.3
19	261 52.9	139 34.8	46.6	174 04.0	24.1	170 25.1	02.0	116 48.1	02.2
20	276 55.3	154 34.1	46.2	189 04.7	24.2	185 27.2	02.0	131 50.3	02.1
21	291 57.8	169 33.5	·· 45.7	204 05.5	·· 24.2	200 29.2	·· 02.0	146 52.5	·· 02.0
22	307 00.2	184 32.9	45.2	219 06.3	24.3	215 31.3	02.0	161 54.6	01.9
23	322 02.7	199 32.2	44.7	234 07.0	24.4	230 33.3	02.0	176 56.8	01.8
Mer. Pass.	h m 1 39.3	v −0.6	d 0.5	v 0.8	d 0.1	v 2.0	d 0.0	v 2.2	d 0.1

STARS		
Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 38.7	S40 23.4
Achernar	335 46.5	S57 20.7
Acrux	173 40.0	S62 58.7
Adhara	255 33.9	S28 56.4
Aldebaran	291 20.4	N16 27.8
Alioth	166 44.8	N56 05.1
Alkaid	153 20.5	N49 25.8
Al Na'ir	28 17.1	S47 04.0
Alnilam	276 13.9	S 1 12.9
Alphard	218 22.9	S 8 33.7
Alphecca	126 33.9	N26 47.7
Alpheratz	358 11.1	N28 58.1
Altair	62 34.3	N 8 48.8
Ankaa	353 41.9	S42 25.4
Antares	112 59.3	S26 22.9
Arcturus	146 20.5	N19 18.1
Atria	108 25.2	S68 59.5
Avior	234 29.5	S59 26.2
Bellatrix	279 01.0	N 6 19.8
Betelgeuse	271 30.6	N 7 24.2
Canopus	264 08.4	S52 40.8
Capella	281 14.4	N45 58.3
Deneb	49 49.4	N45 12.3
Denebola	183 01.4	N14 41.9
Diphda	349 22.7	S18 06.4
Dubhe	194 25.4	N61 52.4
Elnath	278 46.8	N28 35.2
Eltanin	90 58.5	N51 29.9
Enif	34 13.3	N 9 46.6
Fomalhaut	15 53.3	S29 44.2
Gacrux	172 31.4	S56 59.4
Gienah	176 20.3	S17 25.0
Hadar	149 26.5	S60 16.1
Hamal	328 31.0	N23 21.4
Kaus Aust.	84 19.3	S34 23.7
Kochab	137 19.5	N74 15.2
Markab	14 04.9	N15 05.3
Menkar	314 43.2	N 4 00.2
Menkent	148 39.6	S36 15.7
Miaplacidus	221 46.1	S69 37.5
Mirfak	309 18.9	N49 46.7
Nunki	76 31.5	S26 19.4
Peacock	54 01.1	S56 48.4
Pollux	244 01.0	N28 04.8
Procyon	245 28.2	N 5 17.0
Rasalhague	96 31.4	N12 34.8
Regulus	208 12.5	N12 04.6
Rigel	281 38.1	S 8 13.6
Rigil Kent.	140 28.7	S60 44.7
Sabik	102 43.4	S15 41.7
Schedar	350 10.8	N56 24.8
Shaula	96 58.4	S37 05.3
Sirius	258 57.7	S16 41.1
Spica	158 59.9	S11 02.6
Suhail	223 12.7	S43 20.5
Vega	80 57.0	N38 46.1
Zuben'ubi	137 35.4	S15 56.9

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	239 55.5	9 40
Mars	273 24.6	7 26
Jupiter	268 50.6	7 43
Saturn	215 08.6	11 17

G.M.T.	SUN G.H.A.	SUN Dec.	MOON G.H.A.	v	MOON Dec.	d	H.P.
d h	° ′	° ′	° ′	′	° ′	′	′
26 00	179 31.0	N10 31.8	37 42.4	6.8	S16 03.6	5.9	59.3
01	194 31.2	30.9	52 08.2	7.0	15 57.7	5.9	59.3
02	209 31.4	30.1	66 34.2	6.9	15 51.8	6.1	59.3
03	224 31.5	· · 29.2	81 00.1	7.0	15 45.7	6.2	59.3
04	239 31.7	28.3	95 26.1	7.1	15 39.5	6.3	59.3
05	254 31.9	27.5	109 52.2	7.1	15 33.2	6.4	59.3
06	269 32.1	N10 26.6	124 18.3	7.2	S15 26.8	6.4	59.3
07	284 32.2	25.7	138 44.5	7.2	15 20.4	6.6	59.3
08	299 32.4	24.8	153 10.7	7.2	15 13.8	6.6	59.3
F 09	314 32.6	· · 24.0	167 36.9	7.3	15 07.2	6.8	59.3
R 10	329 32.8	23.1	182 03.2	7.4	15 00.4	6.8	59.2
I 11	344 32.9	22.2	196 29.6	7.4	14 53.6	7.0	59.2
D 12	359 33.1	N10 21.4	210 56.0	7.4	S14 46.6	7.0	59.2
A 13	14 33.3	20.5	225 22.4	7.6	14 39.6	7.1	59.2
Y 14	29 33.5	19.6	239 49.0	7.5	14 32.5	7.2	59.2
15	44 33.6	· · 18.8	254 15.5	7.6	14 25.3	7.3	59.2
16	59 33.8	17.9	268 42.1	7.7	14 18.0	7.4	59.2
17	74 34.0	17.0	283 08.8	7.7	14 10.6	7.5	59.2
18	89 34.2	N10 16.1	297 35.5	7.8	S14 03.1	7.5	59.1
19	104 34.4	15.3	312 02.3	7.8	13 55.6	7.6	59.1
20	119 34.5	14.4	326 29.1	7.9	13 48.0	7.8	59.1
21	134 34.7	· · 13.5	340 56.0	7.9	13 40.2	7.7	59.1
22	149 34.9	12.6	355 22.9	8.0	13 32.5	7.9	59.1
23	164 35.1	11.8	9 49.9	8.1	13 24.6	8.0	59.1
27 00	179 35.2	N10 10.9	24 17.0	8.1	S13 16.6	8.0	59.0
01	194 35.4	10.0	38 44.1	8.1	13 08.6	8.1	59.0
02	209 35.6	09.2	53 11.2	8.2	13 00.5	8.2	59.0
03	224 35.8	· · 08.3	67 38.4	8.3	12 52.3	8.2	59.0
04	239 36.0	07.4	82 05.7	8.3	12 44.1	8.4	59.0
05	254 36.1	06.5	96 33.0	8.4	12 35.7	8.4	59.0
06	269 36.3	N10 05.7	111 00.4	8.5	S12 27.3	8.4	59.0
07	284 36.5	04.8	125 27.9	8.5	12 18.9	8.6	58.9
S 08	299 36.7	03.9	139 55.4	8.5	12 10.3	8.6	58.9
A 09	314 36.9	· · 03.0	154 22.9	8.6	12 01.7	8.7	58.9
T 10	329 37.0	02.2	168 50.5	8.7	11 53.0	8.7	58.9
U 11	344 37.2	01.3	183 18.2	8.7	11 44.3	8.8	58.9
R 12	359 37.4	N10 00.4	197 45.9	8.8	S11 35.5	8.9	58.8
D 13	14 37.6	9 59.5	212 13.7	8.8	11 26.6	8.9	58.8
A 14	29 37.8	58.6	226 41.5	8.9	11 17.7	9.0	58.8
Y 15	44 37.9	· · 57.8	241 09.4	9.0	11 08.7	9.0	58.8
16	59 38.1	56.9	255 37.4	9.0	10 59.7	9.1	58.8
17	74 38.3	56.0	270 05.4	9.0	10 50.6	9.2	58.7
18	89 38.5	N 9 55.1	284 33.4	9.1	S10 41.4	9.2	58.7
19	104 38.7	54.2	299 01.5	9.2	10 32.2	9.3	58.7
20	119 38.9	53.4	313 29.7	9.3	10 22.9	9.4	58.7
21	134 39.0	· · 52.5	327 58.0	9.2	10 13.5	9.3	58.7
22	149 39.2	51.6	342 26.2	9.4	10 04.2	9.5	58.6
23	164 39.4	50.7	356 54.6	9.4	9 54.7	9.5	58.6
28 00	179 39.6	N 9 49.9	11 23.0	9.4	S 9 45.2	9.5	58.6
01	194 39.8	49.0	25 51.4	9.6	9 35.7	9.6	58.6
02	209 40.0	48.1	40 20.0	9.5	9 26.1	9.6	58.6
03	224 40.1	· · 47.2	54 48.5	9.7	9 16.5	9.7	58.5
04	239 40.3	46.3	69 17.2	9.6	9 06.8	9.7	58.5
05	254 40.5	45.4	83 45.8	9.8	8 57.1	9.8	58.5
06	269 40.7	N 9 44.6	98 14.6	9.8	S 8 47.3	9.8	58.5
07	284 40.9	43.7	112 43.4	9.8	8 37.5	9.9	58.5
08	299 41.1	42.8	127 12.2	9.9	8 27.6	9.8	58.4
S 09	314 41.2	· · 41.9	141 41.1	10.0	8 17.8	10.0	58.4
U 10	329 41.4	41.0	156 10.1	10.0	8 07.8	9.9	58.4
N 11	344 41.6	40.1	170 39.1	10.0	7 57.9	10.0	58.4
D 12	359 41.8	N 9 39.3	185 08.1	10.1	S 7 47.9	10.1	58.3
A 13	14 42.0	38.4	199 37.2	10.2	7 37.8	10.1	58.3
Y 14	29 42.2	37.5	214 06.4	10.2	7 27.7	10.1	58.3
15	44 42.3	· · 36.6	228 35.6	10.3	7 17.6	10.1	58.3
16	59 42.5	35.7	243 04.9	10.3	7 07.5	10.2	58.2
17	74 42.7	34.8	257 34.2	10.4	6 57.3	10.2	58.2
18	89 42.9	N 9 34.0	272 03.6	10.4	S 6 47.1	10.2	58.2
19	104 43.1	33.1	286 33.0	10.5	6 36.9	10.2	58.2
20	119 43.3	32.2	301 02.5	10.5	6 26.7	10.3	58.1
21	134 43.5	· · 31.3	315 32.0	10.6	6 16.4	10.3	58.1
22	149 43.6	30.4	330 01.6	10.6	6 06.1	10.4	58.1
23	164 43.8	29.5	344 31.2	10.7	5 55.7	10.3	58.1
	S.D. 15.9	d 0.9	S.D. 16.1		16.0		15.9

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 26	Moonrise 27	Moonrise 28	Moonrise 29
°	h m	h m	h m	h m	h m	h m	h m
N 72	////	01 48	03 35	19 34	19 26	19 19	19 13
N 70	////	02 28	03 53	19 06	19 09	19 10	19 10
68	////	02 55	04 07	18 45	18 55	19 02	19 07
66	01 33	03 16	04 18	18 29	18 44	18 56	19 05
64	02 09	03 32	04 27	18 15	18 35	18 50	19 03
62	02 34	03 45	04 35	18 04	18 27	18 45	19 01
60	02 53	03 56	04 42	17 54	18 20	18 41	19 00
N 58	03 09	04 05	04 49	17 45	18 14	18 37	18 58
56	03 22	04 13	04 54	17 37	18 08	18 34	18 57
54	03 33	04 21	04 59	17 31	18 03	18 31	18 56
52	03 42	04 27	05 03	17 25	17 59	18 28	18 55
50	03 50	04 33	05 07	17 19	17 55	18 26	18 54
45	04 08	04 45	05 16	17 07	17 46	18 20	18 52
N 40	04 21	04 55	05 23	16 57	17 38	18 16	18 50
35	04 32	05 03	05 29	16 49	17 32	18 12	18 49
30	04 40	05 09	05 34	16 41	17 27	18 08	18 48
20	04 54	05 21	05 43	16 28	17 17	18 02	18 45
N 10	05 05	05 30	05 51	16 17	17 08	17 57	18 44
0	05 13	05 37	05 58	16 06	17 00	17 52	18 42
S 10	05 19	05 44	06 05	15 55	16 52	17 47	18 40
20	05 25	05 51	06 13	15 44	16 44	17 42	18 38
30	05 29	05 57	06 21	15 31	16 34	17 36	18 36
35	05 31	06 00	06 26	15 23	16 28	17 32	18 35
40	05 33	06 04	06 31	15 15	16 22	17 28	18 33
45	05 34	06 08	06 38	15 04	16 14	17 24	18 32
S 50	05 35	06 12	06 45	14 52	16 05	17 18	18 30
52	05 35	06 14	06 49	14 47	16 01	17 15	18 29
54	05 35	06 16	06 52	14 40	15 56	17 13	18 28
56	05 36	06 19	06 56	14 33	15 51	17 10	18 27
58	05 36	06 21	07 01	14 25	15 45	17 06	18 25
S 60	05 35	06 24	07 06	14 16	15 39	17 02	18 24

Lat.	Sunset	Twilight Civil	Twilight Naut.	Moonset 26	Moonset 27	Moonset 28	Moonset 29
°	h m	h m	h m	h m	h m	h m	h m
N 72	20 24	22 07	////	25 20	01 20	03 19	05 12
N 70	20 07	21 29	////	25 46	01 46	03 35	05 19
68	19 54	21 04	23 33	00 27	02 06	03 47	05 25
66	19 43	20 44	22 23	00 49	02 22	03 57	05 30
64	19 34	20 29	21 49	01 06	02 35	04 05	05 34
62	19 26	20 16	21 25	01 21	02 45	04 12	05 38
60	19 19	20 05	21 07	01 33	02 55	04 18	05 41
N 58	19 13	19 56	20 52	01 43	03 03	04 23	05 44
56	19 08	19 48	20 39	01 52	03 10	04 28	05 46
54	19 03	19 41	20 29	02 00	03 16	04 32	05 48
52	18 59	19 35	20 19	02 08	03 21	04 36	05 50
50	18 55	19 29	20 11	02 14	03 27	04 40	05 52
45	18 47	19 17	19 54	02 28	03 37	04 47	05 56
N 40	18 40	19 08	19 41	02 39	03 46	04 54	05 59
35	18 34	19 00	19 31	02 49	03 54	04 59	06 02
30	18 29	18 53	19 22	02 58	04 01	05 04	06 05
20	18 20	18 42	19 08	03 12	04 13	05 12	06 09
N 10	18 12	18 33	18 58	03 25	04 23	05 19	06 13
0	18 05	18 26	18 50	03 37	04 32	05 25	06 16
S 10	17 58	18 19	18 44	03 49	04 42	05 32	06 19
20	17 50	18 13	18 38	04 01	04 52	05 39	06 23
30	17 42	18 06	18 34	04 15	05 03	05 46	06 27
35	17 37	18 03	18 33	04 24	05 09	05 51	06 29
40	17 32	18 00	18 31	04 33	05 17	05 56	06 32
45	17 26	17 56	18 30	04 44	05 25	06 02	06 35
S 50	17 19	17 52	18 29	04 57	05 35	06 09	06 38
52	17 15	17 50	18 29	05 03	05 40	06 12	06 40
54	17 12	17 48	18 29	05 10	05 45	06 15	06 42
56	17 08	17 45	18 29	05 17	05 51	06 19	06 44
58	17 03	17 43	18 29	05 26	05 58	06 24	06 46
S 60	16 58	17 41	18 29	05 35	06 05	06 28	06 48

Day	SUN Eqn. of Time 00ʰ	SUN Eqn. of Time 12ʰ	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
	m s	m s	h m	h m	h m	d	
26	01 56	01 48	12 02	22 19	09 51	12	○
27	01 39	01 31	12 02	23 13	10 46	13	
28	01 22	01 13	12 01	24 04	11 39	14	

1977 AUGUST 29, 30, 31 (MON., TUES., WED.)

G.M.T.		ARIES	VENUS −3.4		MARS +1.0		JUPITER −1.7		SATURN +0.7	
		G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
d	h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
29	00	337 05.2	214 31.6	N19 44.2	249 07.8	N23 24.4	245 35.3	N23 02.0	191 58.9	N15 01.7
	01	352 07.6	229 31.0	43.7	264 08.5	24.5	260 37.4	02.0	207 01.1	01.6
	02	7 10.1	244 30.3	43.2	279 09.3	24.6	275 39.4	02.0	222 03.2	01.5
	03	22 12.6	259 29.7	·· 42.7	294 10.1	·· 24.6	290 41.5	·· 02.0	237 05.4	·· 01.4
	04	37 15.0	274 29.0	42.2	309 10.8	24.7	305 43.5	02.0	252 07.5	01.3
	05	52 17.5	289 28.4	41.7	324 11.6	24.8	320 45.6	02.0	267 09.7	01.2
	06	67 20.0	304 27.8	N19 41.2	339 12.3	N23 24.8	335 47.6	N23 02.0	282 11.9	N15 01.1
	07	82 22.4	319 27.1	40.7	354 13.1	24.9	350 49.7	02.0	297 14.0	01.0
	08	97 24.9	334 26.5	40.2	9 13.9	24.9	5 51.7	02.0	312 16.2	00.9
M	09	112 27.4	349 25.9	·· 39.7	24 14.6	·· 25.0	20 53.7	·· 02.0	327 18.3	·· 00.8
O	10	127 29.8	4 25.2	39.2	39 15.4	25.1	35 55.8	02.0	342 20.5	00.7
N	11	142 32.3	19 24.6	38.6	54 16.2	25.1	50 57.8	02.0	357 22.6	00.6
D	12	157 34.7	34 23.9	N19 38.1	69 16.9	N23 25.2	65 59.9	N23 02.0	12 24.8	N15 00.5
A	13	172 37.2	49 23.3	37.6	84 17.7	25.3	81 01.9	02.0	27 26.9	00.4
Y	14	187 39.7	64 22.7	37.1	99 18.5	25.3	96 04.0	02.0	42 29.1	00.3
	15	202 42.1	79 22.0	·· 36.6	114 19.2	·· 25.4	111 06.0	·· 02.0	57 31.2	·· 00.2
	16	217 44.6	94 21.4	36.1	129 20.0	25.4	126 08.1	02.0	72 33.4	00.1
	17	232 47.1	109 20.8	35.6	144 20.7	25.5	141 10.1	02.0	87 35.6	15 00.0
	18	247 49.5	124 20.1	N19 35.1	159 21.5	N23 25.6	156 12.2	N23 02.0	102 37.7	N14 59.9
	19	262 52.0	139 19.5	34.6	174 22.3	25.6	171 14.2	02.0	117 39.9	59.8
	20	277 54.5	154 18.9	34.0	189 23.0	25.7	186 16.3	02.0	132 42.0	59.7
	21	292 56.9	169 18.2	·· 33.5	204 23.8	·· 25.7	201 18.3	·· 02.0	147 44.2	·· 59.6
	22	307 59.4	184 17.6	33.0	219 24.6	25.8	216 20.4	02.0	162 46.3	59.5
	23	323 01.8	199 17.0	32.5	234 25.3	25.9	231 22.4	02.0	177 48.5	59.4
30	00	338 04.3	214 16.3	N19 32.0	249 26.1	N23 25.9	246 24.5	N23 02.0	192 50.6	N14 59.3
	01	353 06.8	229 15.7	31.4	264 26.9	26.0	261 26.5	02.0	207 52.8	59.2
	02	8 09.2	244 15.1	30.9	279 27.6	26.0	276 28.5	02.0	222 55.0	59.1
	03	23 11.7	259 14.4	·· 30.4	294 28.4	·· 26.1	291 30.6	·· 02.0	237 57.1	·· 59.0
	04	38 14.2	274 13.8	29.9	309 29.2	26.2	306 32.6	01.9	252 59.3	58.9
	05	53 16.6	289 13.2	29.4	324 29.9	26.2	321 34.7	01.9	268 01.4	58.8
	06	68 19.1	304 12.5	N19 28.8	339 30.7	N23 26.3	336 36.7	N23 01.9	283 03.6	N14 58.7
	07	83 21.6	319 11.9	28.3	354 31.5	26.3	351 38.8	01.9	298 05.7	58.6
T	08	98 24.0	334 11.3	27.8	9 32.2	26.4	6 40.8	01.9	313 07.9	58.5
U	09	113 26.5	349 10.6	·· 27.2	24 33.0	·· 26.4	21 42.9	·· 01.9	328 10.0	·· 58.4
E	10	128 29.0	4 10.0	26.7	39 33.8	26.5	36 45.0	01.9	343 12.2	58.3
S	11	143 31.4	19 09.4	26.2	54 34.5	26.5	51 47.0	01.9	358 14.4	58.2
D	12	158 33.9	34 08.7	N19 25.7	69 35.3	N23 26.6	66 49.1	N23 01.9	13 16.5	N14 58.1
A	13	173 36.3	49 08.1	25.1	84 36.1	26.7	81 51.1	01.9	28 18.7	58.0
Y	14	188 38.8	64 07.5	24.6	99 36.9	26.7	96 53.2	01.9	43 20.8	57.9
	15	203 41.3	79 06.9	·· 24.1	114 37.6	·· 26.8	111 55.2	·· 01.9	58 23.0	·· 57.8
	16	218 43.7	94 06.2	23.5	129 38.4	26.8	126 57.3	01.9	73 25.1	57.7
	17	233 46.2	109 05.6	23.0	144 39.2	26.9	141 59.3	01.9	88 27.3	57.6
	18	248 48.7	124 05.0	N19 22.4	159 39.9	N23 26.9	157 01.4	N23 01.9	103 29.5	N14 57.5
	19	263 51.1	139 04.3	21.9	174 40.7	27.0	172 03.4	01.9	118 31.6	57.4
	20	278 53.6	154 03.7	21.4	189 41.5	27.0	187 05.5	01.9	133 33.8	57.3
	21	293 56.1	169 03.1	·· 20.8	204 42.2	·· 27.1	202 07.5	·· 01.9	148 35.9	·· 57.2
	22	308 58.5	184 02.4	20.3	219 43.0	27.1	217 09.6	01.9	163 38.1	57.1
	23	324 01.0	199 01.8	19.8	234 43.8	27.2	232 11.6	01.9	178 40.2	57.0
31	00	339 03.5	214 01.2	N19 19.2	249 44.6	N23 27.2	247 13.7	N23 01.9	193 42.4	N14 56.9
	01	354 05.9	229 00.6	18.7	264 45.3	27.3	262 15.7	01.9	208 44.5	56.8
	02	9 08.4	243 59.9	18.1	279 46.1	27.3	277 17.8	01.9	223 46.7	56.7
	03	24 10.8	258 59.3	·· 17.6	294 46.9	·· 27.4	292 19.9	·· 01.9	238 48.9	·· 56.6
	04	39 13.3	273 58.7	17.0	309 47.6	27.4	307 21.9	01.9	253 51.0	56.5
	05	54 15.8	288 58.0	16.5	324 48.4	27.5	322 24.0	01.9	268 53.2	56.4
	06	69 18.2	303 57.4	N19 15.9	339 49.2	N23 27.5	337 26.0	N23 01.9	283 55.3	N14 56.3
W	07	84 20.7	318 56.8	15.4	354 50.0	27.6	352 28.1	01.9	298 57.5	56.2
E	08	99 23.2	333 56.2	14.8	9 50.7	27.6	7 30.1	01.9	313 59.6	56.1
D	09	114 25.6	348 55.5	·· 14.3	24 51.5	·· 27.7	22 32.2	·· 01.9	329 01.8	·· 56.0
N	10	129 28.1	3 54.9	13.7	39 52.3	27.7	37 34.2	01.9	344 04.0	56.0
E	11	144 30.6	18 54.3	13.2	54 53.1	27.8	52 36.3	01.9	359 06.1	55.9
S	12	159 33.0	33 53.6	N19 12.6	69 53.8	N23 27.8	67 38.4	N23 01.9	14 08.3	N14 55.8
D	13	174 35.5	48 53.0	12.1	84 54.6	27.9	82 40.4	01.9	29 10.4	55.7
A	14	189 37.9	63 52.4	11.5	99 55.4	27.9	97 42.5	01.8	44 12.6	55.6
Y	15	204 40.4	78 51.8	·· 11.0	114 56.2	·· 28.0	112 44.5	·· 01.8	59 14.7	·· 55.5
	16	219 42.9	93 51.1	10.4	129 56.9	28.0	127 46.6	01.8	74 16.9	55.4
	17	234 45.3	108 50.5	09.8	144 57.7	28.1	142 48.6	01.8	89 19.1	55.3
	18	249 47.8	123 49.9	N19 09.3	159 58.5	N23 28.1	157 50.7	N23 01.8	104 21.2	N14 55.2
	19	264 50.3	138 49.3	08.7	174 59.3	28.2	172 52.8	01.8	119 23.4	55.1
	20	279 52.7	153 48.6	08.2	190 00.0	28.2	187 54.8	01.8	134 25.5	55.0
	21	294 55.2	168 48.0	·· 07.6	205 00.8	·· 28.3	202 56.9	·· 01.8	149 27.7	·· 54.9
	22	309 57.7	183 47.4	07.0	220 01.6	28.3	217 58.9	01.8	164 29.8	54.8
	23	325 00.1	198 46.8	06.5	235 02.4	28.4	233 01.0	01.8	179 32.0	54.7
Mer. Pass.		h m 1 27.5	*v* −0.6	*d* 0.5	*v* 0.8	*d* 0.1	*v* 2.1	*d* 0.0	*v* 2.2	*d* 0.1

STARS		
Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 38.7	S40 23.4
Achernar	335 46.5	S57 20.7
Acrux	173 40.0	S62 58.6
Adhara	255 33.9	S28 56.4
Aldebaran	291 20.4	N16 27.8
Alioth	166 44.8	N56 05.1
Alkaid	153 20.5	N49 25.8
Al Na'ir	28 17.1	S47 04.0
Alnilam	276 13.8	S 1 12.9
Alphard	218 22.9	S 8 33.7
Alphecca	126 33.9	N26 47.7
Alpheratz	358 11.1	N28 58.1
Altair	62 34.3	N 8 48.8
Ankaa	353 41.9	S42 25.4
Antares	112 59.3	S26 22.9
Arcturus	146 20.5	N19 18.1
Atria	108 25.3	S68 59.5
Avior	234 29.5	S59 26.2
Bellatrix	279 01.0	N 6 19.8
Betelgeuse	271 30.6	N 7 24.2
Canopus	264 08.4	S52 40.8
Capella	281 14.4	N45 58.3
Deneb	49 49.4	N45 12.3
Denebola	183 01.4	N14 41.9
Diphda	349 22.7	S18 06.4
Dubhe	194 25.4	N61 52.3
Elnath	278 46.8	N28 35.2
Eltanin	90 58.5	N51 29.9
Enif	34 13.3	N 9 46.6
Fomalhaut	15 53.3	S29 44.2
Gacrux	172 31.4	S56 59.4
Gienah	176 20.3	S17 25.0
Hadar	149 26.5	S60 16.1
Hamal	328 31.0	N23 21.4
Kaus Aust.	84 19.4	S34 23.7
Kochab	137 19.5	N74 15.2
Markab	14 04.9	N15 05.3
Menkar	314 43.2	N 4 00.2
Menkent	148 39.6	S36 15.7
Miaplacidus	221 46.1	S69 37.5
Mirfak	309 18.9	N49 46.7
Nunki	76 31.5	S26 19.4
Peacock	54 01.1	S56 48.4
Pollux	244 00.9	N28 04.7
Procyon	245 28.2	N 5 17.0
Rasalhague	96 31.4	N12 34.8
Regulus	208 12.5	N12 04.6
Rigel	281 38.0	S 8 13.6
Rigil Kent.	140 28.8	S60 44.7
Sabik	102 43.4	S15 41.7
Schedar	350 10.8	N56 24.8
Shaula	96 58.4	S37 05.3
Sirius	258 57.7	S16 41.1
Spica	158 59.9	S11 02.6
Suhail	223 12.7	S43 20.5
Vega	80 57.0	N38 46.1
Zuben'ubi	137 35.4	S15 56.9

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	236 12.0	9 43
Mars	271 21.8	7 22
Jupiter	268 20.1	7 33
Saturn	214 46.3	11 07

G.M.T.	SUN G.H.A.	SUN Dec.	MOON G.H.A.	MOON *v*	MOON Dec.	MOON *d*	MOON H.P.
d h	° ′	° ′	° ′	′	° ′	′	′
29 00	179 44.0	N 9 28.6	359 00.9	10.7	S 5 45.4	10.4	58.0
01	194 44.2	27.8	13 30.6	10.8	5 35.0	10.4	58.0
02	209 44.4	26.9	28 00.4	10.8	5 24.6	10.4	58.0
03	224 44.6	·· 26.0	42 30.2	10.9	5 14.2	10.4	58.0
04	239 44.8	25.1	57 00.1	10.9	5 03.8	10.5	57.9
05	254 45.0	24.2	71 30.0	11.0	4 53.3	10.4	57.9
06	269 45.1	N 9 23.3	86 00.0	11.0	S 4 42.9	10.5	57.9
07	284 45.3	22.4	100 30.0	11.0	4 32.4	10.5	57.9
08	299 45.5	21.5	115 00.0	11.1	4 21.9	10.5	57.8
M 09	314 45.7	·· 20.7	129 30.1	11.2	4 11.4	10.5	57.8
O 10	329 45.9	19.8	144 00.3	11.2	4 00.9	10.6	57.8
N 11	344 46.1	18.9	158 30.5	11.2	3 50.3	10.5	57.7
D 12	359 46.3	N 9 18.0	173 00.7	11.3	S 3 39.8	10.6	57.7
A 13	14 46.5	17.1	187 31.0	11.3	3 29.2	10.5	57.7
Y 14	29 46.6	16.2	202 01.3	11.4	3 18.7	10.6	57.7
15	44 46.8	·· 15.3	216 31.7	11.4	3 08.1	10.5	57.6
16	59 47.0	14.4	231 02.1	11.4	2 57.6	10.6	57.6
17	74 47.2	13.5	245 32.5	11.5	2 47.0	10.6	57.6
18	89 47.4	N 9 12.6	260 03.0	11.5	S 2 36.4	10.6	57.6
19	104 47.6	11.7	274 33.5	11.6	2 25.8	10.6	57.5
20	119 47.8	10.9	289 04.1	11.6	2 15.2	10.5	57.5
21	134 48.0	·· 10.0	303 34.7	11.7	2 04.7	10.6	57.5
22	149 48.2	09.1	318 05.4	11.7	1 54.1	10.6	57.4
23	164 48.4	08.2	332 36.1	11.7	1 43.5	10.6	57.4
30 00	179 48.5	N 9 07.3	347 06.8	11.7	S 1 32.9	10.6	57.4
01	194 48.7	06.4	1 37.5	11.8	1 22.3	10.5	57.4
02	209 48.9	05.5	16 08.3	11.9	1 11.8	10.6	57.3
03	224 49.1	·· 04.6	30 39.2	11.9	1 01.2	10.5	57.3
04	239 49.3	03.7	45 10.1	11.9	0 50.7	10.6	57.3
05	254 49.5	02.8	59 41.0	11.9	0 40.1	10.5	57.2
06	269 49.7	N 9 01.9	74 11.9	12.0	S 0 29.6	10.6	57.2
07	284 49.9	01.0	88 42.9	12.0	0 19.0	10.5	57.2
08	299 50.1	9 00.1	103 13.9	12.0	S 0 08.5	10.5	57.2
T 09	314 50.3	8 59.2	117 44.9	12.1	N 0 02.0	10.5	57.1
U 10	329 50.5	58.3	132 16.0	12.1	0 12.5	10.5	57.1
E 11	344 50.6	57.4	146 47.1	12.2	0 23.0	10.5	57.1
S 12	359 50.8	N 8 56.6	161 18.3	12.2	N 0 33.5	10.5	57.0
D 13	14 51.0	55.7	175 49.5	12.2	0 44.0	10.4	57.0
A 14	29 51.2	54.8	190 20.7	12.2	0 54.4	10.4	57.0
Y 15	44 51.4	·· 53.9	204 51.9	12.3	1 04.8	10.5	57.0
16	59 51.6	53.0	219 23.2	12.3	1 15.3	10.4	56.9
17	74 51.8	52.1	233 54.5	12.3	1 25.7	10.3	56.9
18	89 52.0	N 8 51.2	248 25.8	12.3	N 1 36.0	10.4	56.9
19	104 52.2	50.3	262 57.1	12.4	1 46.4	10.3	56.8
20	119 52.4	49.4	277 28.5	12.4	1 56.7	10.4	56.8
21	134 52.6	·· 48.5	291 59.9	12.5	2 07.1	10.3	56.8
22	149 52.8	47.6	306 31.4	12.4	2 17.4	10.2	56.8
23	164 53.0	46.7	321 02.8	12.5	2 27.6	10.3	56.7
31 00	179 53.1	N 8 45.8	335 34.3	12.5	N 2 37.9	10.2	56.7
01	194 53.3	44.9	350 05.8	12.5	2 48.1	10.2	56.7
02	209 53.5	44.0	4 37.3	12.6	2 58.3	10.2	56.6
03	224 53.7	·· 43.1	19 08.9	12.6	3 08.5	10.2	56.6
04	239 53.9	42.2	33 40.5	12.6	3 18.7	10.1	56.6
05	254 54.1	41.3	48 12.1	12.6	3 28.8	10.1	56.6
06	269 54.3	N 8 40.4	62 43.7	12.7	N 3 38.9	10.0	56.5
W 07	284 54.5	39.5	77 15.4	12.6	3 48.9	10.1	56.5
E 08	299 54.7	38.6	91 47.0	12.7	3 59.0	10.0	56.5
D 09	314 54.9	·· 37.7	106 18.7	12.7	4 09.0	10.0	56.4
N 10	329 55.1	36.8	120 50.4	12.8	4 19.0	9.9	56.4
E 11	344 55.3	35.9	135 22.2	12.7	4 28.9	9.9	56.4
S 12	359 55.5	N 8 35.0	149 53.9	12.8	N 4 38.8	9.9	56.4
D 13	14 55.7	34.1	164 25.7	12.8	4 48.7	9.9	56.3
A 14	29 55.9	33.2	178 57.5	12.8	4 58.6	9.8	56.3
Y 15	44 56.1	·· 32.3	193 29.3	12.8	5 08.4	9.7	56.3
16	59 56.3	31.4	208 01.1	12.8	5 18.1	9.8	56.2
17	74 56.5	30.5	222 32.9	12.9	5 27.9	9.7	56.2
18	89 56.7	N 8 29.6	237 04.8	12.9	N 5 37.6	9.7	56.2
19	104 56.9	28.7	251 36.7	12.8	5 47.3	9.6	56.2
20	119 57.0	27.8	266 08.5	12.9	5 56.9	9.6	56.1
21	134 57.2	·· 26.9	280 40.4	13.0	6 06.5	9.5	56.1
22	149 57.4	25.9	295 12.4	12.9	6 16.0	9.5	56.1
23	164 57.6	25.0	309 44.3	12.9	6 25.5	9.5	56.0
	S.D. 15.9	*d* 0.9	S.D. 15.7		15.5		15.4

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 29	Moonrise 30	Moonrise 31	Moonrise 1
°	h m	h m	h m	h m	h m	h m	h m
N 72	////	02 14	03 50	19 13	19 08	19 02	18 57
N 70	////	02 47	04 06	19 10	19 10	19 10	19 11
68	01 07	03 10	04 18	19 07	19 12	19 17	19 22
66	01 56	03 28	04 28	19 05	19 14	19 22	19 32
64	02 25	03 42	04 36	19 03	19 15	19 27	19 40
62	02 47	03 54	04 43	19 01	19 16	19 31	19 47
60	03 04	04 04	04 50	19 00	19 17	19 34	19 53
N 58	03 18	04 12	04 55	18 58	19 18	19 38	19 58
56	03 29	04 20	05 00	18 57	19 19	19 40	20 03
54	03 40	04 27	05 04	18 56	19 20	19 43	20 07
52	03 48	04 32	05 08	18 55	19 20	19 45	20 11
50	03 56	04 38	05 12	18 54	19 21	19 47	20 15
45	04 12	04 49	05 19	18 52	19 22	19 52	20 22
N 40	04 24	04 58	05 26	18 50	19 23	19 56	20 29
35	04 34	05 05	05 31	18 49	19 24	19 59	20 34
30	04 42	05 11	05 36	18 48	19 25	20 02	20 39
20	04 55	05 21	05 44	18 45	19 27	20 07	20 48
N 10	05 05	05 30	05 51	18 44	19 28	20 12	20 55
0	05 12	05 36	05 57	18 42	19 30	20 16	21 03
S 10	05 18	05 42	06 04	18 40	19 31	20 21	21 10
20	05 22	05 48	06 10	18 38	19 32	20 26	21 17
30	05 26	05 54	06 18	18 36	19 34	20 31	21 26
35	05 27	05 57	06 22	18 35	19 35	20 34	21 31
40	05 28	06 00	06 27	18 33	19 36	20 38	21 37
45	05 29	06 03	06 32	18 32	19 38	20 42	21 44
S 50	05 29	06 06	06 39	18 30	19 39	20 47	21 52
52	05 29	06 08	06 42	18 29	19 40	20 49	21 56
54	05 29	06 10	06 45	18 28	19 41	20 52	22 00
56	05 28	06 11	06 49	18 27	19 42	20 54	22 05
58	05 28	06 13	06 53	18 25	19 43	20 57	22 10
S 60	05 27	06 15	06 58	18 24	19 44	21 01	22 16

Lat.	Sunset	Twilight Civil	Twilight Naut.	Moonset 29	Moonset 30	Moonset 31	Moonset 1
°	h m	h m	h m	h m	h m	h m	h m
N 72	20 07	21 40	////	05 12	07 00	08 44	10 26
N 70	19 53	21 10	////	05 19	07 00	08 38	10 13
68	19 41	20 48	22 43	05 25	07 01	08 33	10 03
66	19 31	20 30	22 00	05 30	07 01	08 29	09 55
64	19 23	20 17	21 32	05 34	07 01	08 26	09 48
62	19 16	20 05	21 11	05 38	07 02	08 23	09 42
60	19 10	19 55	20 55	05 41	07 02	08 21	09 37
N 58	19 05	19 47	20 41	05 44	07 02	08 18	09 32
56	19 00	19 40	20 30	05 46	07 02	08 17	09 28
54	18 56	19 33	20 20	05 48	07 03	08 15	09 25
52	18 52	19 28	20 11	05 50	07 03	08 13	09 21
50	18 49	19 22	20 04	05 52	07 03	08 12	09 18
45	18 41	19 12	19 48	05 56	07 03	08 09	09 12
N 40	18 35	19 03	19 36	05 59	07 04	08 06	09 06
35	18 30	18 56	19 26	06 02	07 04	08 04	09 02
30	18 25	18 49	19 18	06 05	07 04	08 02	08 58
20	18 17	18 39	19 06	06 09	07 04	07 58	08 51
N 10	18 10	18 32	18 56	06 13	07 05	07 55	08 44
0	18 04	18 25	18 49	06 16	07 05	07 52	08 39
S 10	17 58	18 19	18 43	06 19	07 05	07 49	08 33
20	17 51	18 13	18 39	06 23	07 05	07 46	08 27
30	17 44	18 08	18 36	06 27	07 05	07 43	08 20
35	17 40	18 05	18 35	06 29	07 06	07 41	08 16
40	17 35	18 02	18 34	06 32	07 06	07 38	08 11
45	17 29	17 59	18 33	06 35	07 06	07 36	08 06
S 50	17 23	17 56	18 33	06 38	07 06	07 33	07 59
52	17 20	17 54	18 33	06 40	07 06	07 31	07 57
54	17 17	17 53	18 34	06 42	07 06	07 30	07 53
56	17 13	17 51	18 34	06 44	07 06	07 28	07 50
58	17 09	17 49	18 35	06 46	07 06	07 26	07 46
S 60	17 05	17 47	18 35	06 48	07 06	07 24	07 42

Day	SUN Eqn. of Time 00ʰ	SUN Eqn. of Time 12ʰ	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
	m s	m s	h m	h m	h m	d	
29	01 04	00 55	12 01	00 04	12 29	15	
30	00 46	00 37	12 01	00 53	13 17	16	○
31	00 28	00 18	12 00	01 41	14 04	17	

1977 SEPTEMBER 1, 2, 3 (THURS., FRI., SAT.)

G.M.T.		ARIES	VENUS −3.4		MARS +1.0		JUPITER −1.7		SATURN +0.7	
		G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
d h		° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
1 00		340 02.6	213 46.1	N19 05.9	250 03.1	N23 28.4	248 03.1	N23 01.8	194 34.2	N14 54.6
01		355 05.1	228 45.5	05.3	265 03.9	28.4	263 05.1	01.8	209 36.3	54.5
02		10 07.5	243 44.9	04.8	280 04.7	28.5	278 07.2	01.8	224 38.5	54.4
03		25 10.0	258 44.3	·· 04.2	295 05.5	·· 28.5	293 09.2	·· 01.8	239 40.6	·· 54.3
04		40 12.4	273 43.6	03.6	310 06.2	28.6	308 11.3	01.8	254 42.8	54.2
05		55 14.9	288 43.0	03.1	325 07.0	28.6	323 13.4	01.8	269 44.9	54.1
06		70 17.4	303 42.4	N19 02.5	340 07.8	N23 28.7	338 15.4	N23 01.8	284 47.1	N14 54.0
07		85 19.8	318 41.8	01.9	355 08.6	28.7	353 17.5	01.8	299 49.3	53.9
08	T	100 22.3	333 41.2	01.3	10 09.4	28.7	8 19.5	01.8	314 51.4	53.8
09	H	115 24.8	348 40.5	·· 00.8	25 10.1	·· 28.8	23 21.6	·· 01.8	329 53.6	·· 53.7
10	U	130 27.2	3 39.9	19 00.2	40 10.9	28.8	38 23.7	01.8	344 55.7	53.6
11	R	145 29.7	18 39.3	18 59.6	55 11.7	28.9	53 25.7	01.8	359 57.9	53.5
12	S	160 32.2	33 38.7	N18 59.0	70 12.5	N23 28.9	68 27.8	N23 01.8	15 00.0	N14 53.4
13	D	175 34.6	48 38.0	58.5	85 13.3	28.9	83 29.9	01.8	30 02.2	53.3
14	A	190 37.1	63 37.4	57.9	100 14.0	29.0	98 31.9	01.8	45 04.4	53.2
15	Y	205 39.6	78 36.8	·· 57.3	115 14.8	·· 29.0	113 34.0	·· 01.8	60 06.5	·· 53.1
16		220 42.0	93 36.2	56.7	130 15.6	29.1	128 36.0	01.8	75 08.7	53.0
17		235 44.5	108 35.6	56.1	145 16.4	29.1	143 38.1	01.8	90 10.8	52.9
18		250 46.9	123 34.9	N18 55.6	160 17.2	N23 29.2	158 40.2	N23 01.8	105 13.0	N14 52.8
19		265 49.4	138 34.3	55.0	175 17.9	29.2	173 42.2	01.8	120 15.2	52.7
20		280 51.9	153 33.7	54.4	190 18.7	29.2	188 44.3	01.7	135 17.3	52.6
21		295 54.3	168 33.1	·· 53.8	205 19.5	·· 29.3	203 46.4	·· 01.7	150 19.5	·· 52.5
22		310 56.8	183 32.5	53.2	220 20.3	29.3	218 48.4	01.7	165 21.6	52.4
23		325 59.3	198 31.8	52.6	235 21.1	29.3	233 50.5	01.7	180 23.8	52.3
2 00		341 01.7	213 31.2	N18 52.0	250 21.8	N23 29.4	248 52.6	N23 01.7	195 25.9	N14 52.2
01		356 04.2	228 30.6	51.5	265 22.6	29.4	263 54.6	01.7	210 28.1	52.1
02		11 06.7	243 30.0	50.9	280 23.4	29.5	278 56.7	01.7	225 30.3	52.0
03		26 09.1	258 29.4	·· 50.3	295 24.2	·· 29.5	293 58.8	·· 01.7	240 32.4	·· 51.9
04		41 11.6	273 28.7	49.7	310 25.0	29.5	309 00.8	01.7	255 34.6	51.8
05		56 14.1	288 28.1	49.1	325 25.8	29.6	324 02.9	01.7	270 36.7	51.7
06		71 16.5	303 27.5	N18 48.5	340 26.5	N23 29.6	339 05.0	N23 01.7	285 38.9	N14 51.6
07		86 19.0	318 26.9	47.9	355 27.3	29.6	354 07.0	01.7	300 41.1	51.5
08		101 21.4	333 26.3	47.3	10 28.1	29.7	9 09.1	01.7	315 43.2	51.4
09	F	116 23.9	348 25.7	·· 46.7	25 28.9	·· 29.7	24 11.2	·· 01.7	330 45.4	·· 51.3
10	R	131 26.4	3 25.0	46.1	40 29.7	29.7	39 13.2	01.7	345 47.5	51.2
11	I	146 28.8	18 24.4	45.5	55 30.5	29.8	54 15.3	01.7	0 49.7	51.1
12	D	161 31.3	33 23.8	N18 44.9	70 31.2	N23 29.8	69 17.4	N23 01.7	15 51.8	N14 51.0
13	A	176 33.8	48 23.2	44.3	85 32.0	29.8	84 19.4	01.7	30 54.0	50.9
14	Y	191 36.2	63 22.6	43.7	100 32.8	29.9	99 21.5	01.7	45 56.2	50.8
15		206 38.7	78 22.0	·· 43.1	115 33.6	·· 29.9	114 23.6	·· 01.7	60 58.3	·· 50.8
16		221 41.2	93 21.3	42.5	130 34.4	29.9	129 25.6	01.7	76 00.5	50.7
17		236 43.6	108 20.7	41.9	145 35.2	30.0	144 27.7	01.7	91 02.6	50.6
18		251 46.1	123 20.1	N18 41.3	160 36.0	N23 30.0	159 29.8	N23 01.7	106 04.8	N14 50.5
19		266 48.5	138 19.5	40.7	175 36.7	30.0	174 31.8	01.7	121 07.0	50.4
20		281 51.0	153 18.9	40.1	190 37.5	30.1	189 33.9	01.7	136 09.1	50.3
21		296 53.5	168 18.3	·· 39.5	205 38.3	·· 30.1	204 36.0	·· 01.7	151 11.3	·· 50.2
22		311 55.9	183 17.6	38.9	220 39.1	30.1	219 38.0	01.7	166 13.4	50.1
23		326 58.4	198 17.0	38.3	235 39.9	30.2	234 40.1	01.6	181 15.6	50.0
3 00		342 00.9	213 16.4	N18 37.7	250 40.7	N23 30.2	249 42.2	N23 01.6	196 17.8	N14 49.9
01		357 03.3	228 15.8	37.0	265 41.5	30.2	264 44.3	01.6	211 19.9	49.8
02		12 05.8	243 15.2	36.4	280 42.3	30.3	279 46.3	01.6	226 22.1	49.7
03		27 08.3	258 14.6	·· 35.8	295 43.0	·· 30.3	294 48.4	·· 01.6	241 24.2	·· 49.6
04		42 10.7	273 14.0	35.2	310 43.8	30.3	309 50.5	01.6	256 26.4	49.5
05		57 13.2	288 13.4	34.6	325 44.6	30.4	324 52.5	01.6	271 28.6	49.4
06		72 15.7	303 12.7	N18 34.0	340 45.4	N23 30.4	339 54.6	N23 01.6	286 30.7	N14 49.3
07		87 18.1	318 12.1	33.4	355 46.2	30.4	354 56.7	01.6	301 32.9	49.2
08	S	102 20.6	333 11.5	32.7	10 47.0	30.4	9 58.8	01.6	316 35.0	49.1
09	A	117 23.0	348 10.9	·· 32.1	25 47.8	·· 30.5	25 00.8	·· 01.6	331 37.2	·· 49.0
10	T	132 25.5	3 10.3	31.5	40 48.6	30.5	40 02.9	01.6	346 39.4	48.9
11	U	147 28.0	18 09.7	30.9	55 49.4	30.5	55 05.0	01.6	1 41.5	48.8
12	R	162 30.4	33 09.1	N18 30.3	70 50.2	N23 30.6	70 07.1	N23 01.6	16 43.7	N14 48.7
13	D	177 32.9	48 08.5	29.6	85 50.9	30.6	85 09.1	01.6	31 45.8	48.6
14	A	192 35.4	63 07.8	29.0	100 51.7	30.6	100 11.2	01.6	46 48.0	48.5
15	Y	207 37.8	78 07.2	·· 28.4	115 52.5	·· 30.6	115 13.3	·· 01.6	61 50.2	·· 48.4
16		222 40.3	93 06.6	27.8	130 53.3	30.7	130 15.4	01.6	76 52.3	48.3
17		237 42.8	108 06.0	27.1	145 54.1	30.7	145 17.4	01.6	91 54.5	48.2
18		252 45.2	123 05.4	N18 26.5	160 54.9	N23 30.7	160 19.5	N23 01.6	106 56.6	N14 48.1
19		267 47.7	138 04.8	25.9	175 55.7	30.7	175 21.6	01.6	121 58.8	48.0
20		282 50.2	153 04.2	25.3	190 56.5	30.8	190 23.7	01.6	137 01.0	47.9
21		297 52.6	168 03.6	·· 24.6	205 57.3	·· 30.8	205 25.7	·· 01.6	152 03.1	·· 47.8
22		312 55.1	183 03.0	24.0	220 58.1	30.8	220 27.8	01.6	167 05.3	47.7
23		327 57.5	198 02.4	23.4	235 58.9	30.8	235 29.9	01.5	182 07.4	47.6
Mer. Pass.		h m 1 15.7	*v* −0.6	*d* 0.6	*v* 0.8	*d* 0.0	*v* 2.1	*d* 0.0	*v* 2.2	*d* 0.1

STARS		
Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 38.6	S40 23.4
Achernar	335 46.5	S57 20.8
Acrux	173 40.0	S62 58.6
Adhara	255 33.9	S28 56.4
Aldebaran	291 20.3	N16 27.8
Alioth	166 44.8	N56 05.1
Alkaid	153 20.5	N49 25.8
Al Na'ir	28 17.1	S47 04.0
Alnilam	276 13.8	S 1 12.9
Alphard	218 22.9	S 8 33.7
Alphecca	126 33.9	N26 47.7
Alpheratz	358 11.1	N28 58.1
Altair	62 34.3	N 8 48.8
Ankaa	353 41.9	S42 25.4
Antares	112 59.4	S26 22.9
Arcturus	146 20.5	N19 18.1
Atria	108 25.3	S68 59.5
Avior	234 29.5	S59 26.2
Bellatrix	279 01.0	N 6 19.8
Betelgeuse	271 30.6	N 7 24.2
Canopus	264 08.3	S52 40.8
Capella	281 14.4	N45 58.3
Deneb	49 49.4	N45 12.3
Denebola	183 01.4	N14 41.9
Diphda	349 22.7	S18 06.4
Dubhe	194 25.4	N61 52.3
Elnath	278 46.8	N28 35.2
Eltanin	90 58.5	N51 29.9
Enif	34 13.3	N 9 46.6
Fomalhaut	15 53.3	S29 44.3
Gacrux	172 31.4	S56 59.4
Gienah	176 20.3	S17 25.0
Hadar	149 26.5	S60 16.1
Hamal	328 31.0	N23 21.4
Kaus Aust.	84 19.4	S34 23.7
Kochab	137 19.6	N74 15.2
Markab	14 04.9	N15 05.3
Menkar	314 43.1	N 4 00.2
Menkent	148 39.6	S36 15.7
Miaplacidus	221 46.1	S69 37.5
Mirfak	309 18.8	N49 46.7
Nunki	76 31.5	S26 19.4
Peacock	54 01.2	S56 48.4
Pollux	244 00.9	N28 04.7
Procyon	245 28.1	N 5 17.0
Rasalhague	96 31.4	N12 34.8
Regulus	208 12.5	N12 04.6
Rigel	281 38.0	S 8 13.5
Rigil Kent.	140 28.8	S60 44.7
Sabik	102 43.4	S15 41.7
Schedar	350 10.8	N56 24.9
Shaula	96 58.4	S37 05.3
Sirius	258 57.7	S16 41.1
Spica	158 59.9	S11 02.6
Suhail	223 12.6	S43 20.5
Vega	80 57.0	N38 46.1
Zuben'ubi	137 35.4	S15 56.9
	S.H.A.	Mer. Pass.
	° ′	h m
Venus	232 29.5	9 46
Mars	269 20.1	7 18
Jupiter	267 50.8	7 23
Saturn	214 24.2	10 57

	G.M.T.	SUN G.H.A.	SUN Dec.	MOON G.H.A.	MOON v	MOON Dec.	MOON d	MOON H.P.
d	h	° ′	° ′	° ′	′	° ′	′	′
1	00	179 57.8	N 8 24.1	324 16.2	13.0	N 6 35.0	9.4	56.0
	01	194 58.0	23.2	338 48.2	12.9	6 44.4	9.4	56.0
	02	209 58.2	22.3	353 20.1	13.0	6 53.8	9.4	56.0
	03	224 58.4	·· 21.4	7 52.1	13.0	7 03.2	9.3	55.9
	04	239 58.6	20.5	22 24.1	13.0	7 12.5	9.2	55.9
	05	254 58.8	19.6	36 56.1	13.0	7 21.7	9.3	55.9
	06	269 59.0	N 8 18.7	51 28.1	13.0	N 7 31.0	9.1	55.9
	07	284 59.2	17.8	66 00.1	13.1	7 40.1	9.2	55.8
T	08	299 59.4	16.9	80 32.2	13.0	7 49.3	9.0	55.8
H	09	314 59.6	·· 16.0	95 04.2	13.1	7 58.3	9.1	55.8
U	10	329 59.8	15.1	109 36.3	13.0	8 07.4	9.0	55.8
R	11	345 00.0	14.2	124 08.3	13.1	8 16.4	8.9	55.7
S	12	0 00.2	N 8 13.3	138 40.4	13.0	N 8 25.3	8.9	55.7
D	13	15 00.4	12.4	153 12.4	13.1	8 34.2	8.8	55.7
A	14	30 00.6	11.4	167 44.5	13.1	8 43.0	8.8	55.6
Y	15	45 00.8	·· 10.5	182 16.6	13.1	8 51.8	8.8	55.6
	16	60 01.0	09.6	196 48.7	13.1	9 00.6	8.7	55.6
	17	75 01.2	08.7	211 20.8	13.1	9 09.3	8.6	55.6
	18	90 01.4	N 8 07.8	225 52.9	13.1	N 9 17.9	8.6	55.5
	19	105 01.6	06.9	240 25.0	13.1	9 26.5	8.5	55.5
	20	120 01.8	06.0	254 57.1	13.1	9 35.0	8.5	55.5
	21	135 02.0	·· 05.1	269 29.2	13.1	9 43.5	8.5	55.5
	22	150 02.2	04.2	284 01.3	13.1	9 52.0	8.3	55.4
	23	165 02.4	03.3	298 33.4	13.2	10 00.3	8.4	55.4
2	00	180 02.6	N 8 02.4	313 05.6	13.1	N10 08.7	8.2	55.4
	01	195 02.8	01.4	327 37.7	13.1	10 16.9	8.3	55.4
	02	210 03.0	8 00.5	342 09.8	13.1	10 25.2	8.1	55.4
	03	225 03.2	7 59.6	356 41.9	13.2	10 33.3	8.1	55.3
	04	240 03.4	58.7	11 14.1	13.1	10 41.4	8.1	55.3
	05	255 03.6	57.8	25 46.2	13.1	10 49.5	8.0	55.3
	06	270 03.8	N 7 56.9	40 18.3	13.2	N10 57.5	7.9	55.3
	07	285 04.0	56.0	54 50.5	13.1	11 05.4	7.9	55.2
	08	300 04.2	55.1	69 22.6	13.1	11 13.3	7.8	55.2
F	09	315 04.4	·· 54.2	83 54.7	13.2	11 21.1	7.8	55.2
R	10	330 04.6	53.2	98 26.9	13.1	11 28.9	7.7	55.2
I	11	345 04.8	52.3	112 59.0	13.1	11 36.6	7.6	55.2
D	12	0 05.0	N 7 51.4	127 31.1	13.1	N11 44.2	7.6	55.1
A	13	15 05.2	50.5	142 03.2	13.1	11 51.8	7.5	55.1
Y	14	30 05.4	49.6	156 35.3	13.2	11 59.3	7.5	55.1
	15	45 05.6	·· 48.7	171 07.5	13.1	12 06.8	7.4	55.1
	16	60 05.8	47.8	185 39.6	13.1	12 14.2	7.3	55.0
	17	75 06.0	46.9	200 11.7	13.1	12 21.5	7.3	55.0
	18	90 06.2	N 7 45.9	214 43.8	13.1	N12 28.8	7.2	55.0
	19	105 06.4	45.0	229 15.9	13.1	12 36.0	7.2	55.0
	20	120 06.6	44.1	243 48.0	13.1	12 43.2	7.0	55.0
	21	135 06.8	·· 43.2	258 20.1	13.1	12 50.2	7.1	54.9
	22	150 07.0	42.3	272 52.2	13.1	12 57.3	6.9	54.9
	23	165 07.2	41.4	287 24.3	13.1	13 04.2	6.9	54.9
3	00	180 07.4	N 7 40.5	301 56.4	13.0	N13 11.1	6.8	54.9
	01	195 07.6	39.5	316 28.4	13.1	13 17.9	6.8	54.9
	02	210 07.8	38.6	331 00.5	13.1	13 24.7	6.7	54.9
	03	225 08.0	·· 37.7	345 32.6	13.0	13 31.4	6.6	54.8
	04	240 08.2	36.8	0 04.6	13.1	13 38.0	6.6	54.8
	05	255 08.4	35.9	14 36.7	13.0	13 44.6	6.5	54.8
	06	270 08.6	N 7 35.0	29 08.7	13.1	N13 51.1	6.4	54.8
	07	285 08.8	34.0	43 40.8	13.0	13 57.5	6.4	54.8
S	08	300 09.0	33.1	58 12.8	13.0	14 03.9	6.3	54.7
A	09	315 09.3	·· 32.2	72 44.8	13.0	14 10.2	6.2	54.7
T	10	330 09.5	31.3	87 16.8	13.0	14 16.4	6.2	54.7
U	11	345 09.7	30.4	101 48.8	13.0	14 22.6	6.1	54.7
R	12	0 09.9	N 7 29.4	116 20.8	13.0	N14 28.7	6.0	54.7
D	13	15 10.1	28.5	130 52.8	13.0	14 34.7	6.0	54.7
A	14	30 10.3	27.6	145 24.8	13.0	14 40.7	5.8	54.7
Y	15	45 10.5	·· 26.7	159 56.8	12.9	14 46.5	5.8	54.6
	16	60 10.7	25.8	174 28.7	13.0	14 52.3	5.8	54.6
	17	75 10.9	24.9	189 00.7	12.9	14 58.1	5.7	54.6
	18	90 11.1	N 7 23.9	203 32.6	13.0	N15 03.8	5.6	54.6
	19	105 11.3	23.0	218 04.6	12.9	15 09.4	5.5	54.6
	20	120 11.5	22.1	232 36.5	12.9	15 14.9	5.4	54.6
	21	135 11.7	·· 21.2	247 08.4	12.9	15 20.3	5.4	54.6
	22	150 11.9	20.3	261 40.3	12.9	15 25.7	5.3	54.5
	23	165 12.1	19.3	276 12.2	12.9	15 31.0	5.3	54.5
		S.D. 15.9	*d* 0.9	S.D. 15.2		15.0		14.9

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 1	Moonrise 2	Moonrise 3	Moonrise 4
°	h m	h m	h m	h m	h m	h m	h m
N 72	////	02 37	04 05	18 57	18 51	18 44	18 35
N 70	////	03 04	04 18	19 11	19 13	19 17	19 26
68	01 38	03 24	04 29	19 22	19 30	19 41	19 58
66	02 15	03 40	04 38	19 32	19 44	20 00	20 22
64	02 39	03 52	04 45	19 40	19 56	20 15	20 40
62	02 58	04 03	04 51	19 47	20 05	20 28	20 56
60	03 14	04 12	04 57	19 53	20 14	20 38	21 08
N 58	03 26	04 20	05 01	19 58	20 21	20 48	21 20
56	03 37	04 26	05 06	20 03	20 28	20 56	21 29
54	03 46	04 32	05 10	20 07	20 34	21 04	21 38
52	03 54	04 38	05 13	20 11	20 39	21 10	21 45
50	04 01	04 42	05 16	20 15	20 44	21 16	21 52
45	04 16	04 53	05 23	20 22	20 54	21 29	22 07
N 40	04 28	05 01	05 28	20 29	21 03	21 40	22 19
35	04 37	05 07	05 33	20 34	21 11	21 49	22 30
30	04 44	05 13	05 37	20 39	21 17	21 57	22 39
20	04 56	05 22	05 45	20 48	21 29	22 11	22 55
N 10	05 05	05 29	05 51	20 55	21 39	22 23	23 08
0	05 11	05 36	05 56	21 03	21 49	22 35	23 21
S 10	05 16	05 41	06 02	21 10	21 58	22 46	23 34
20	05 20	05 46	06 08	21 17	22 08	22 59	23 48
30	05 23	05 50	06 14	21 26	22 20	23 13	24 04
35	05 23	05 53	06 18	21 31	22 27	23 21	24 14
40	05 24	05 55	06 22	21 37	22 35	23 31	24 24
45	05 24	05 58	06 27	21 44	22 44	23 42	24 37
S 50	05 23	06 00	06 33	21 52	22 55	23 55	24 52
52	05 22	06 01	06 35	21 56	23 00	24 02	00 02
54	05 22	06 03	06 38	22 00	23 06	24 09	00 09
56	05 21	06 04	06 41	22 05	23 12	24 16	00 16
58	05 20	06 05	06 45	22 10	23 19	24 25	00 25
S 60	05 19	06 07	06 49	22 16	23 27	24 35	00 35

Lat.	Sunset	Twilight Civil	Twilight Naut.	Moonset 1	Moonset 2	Moonset 3	Moonset 4
°	h m	h m	h m	h m	h m	h m	h m
N 72	19 51	21 17	////	10 26	12 08	13 50	15 37
N 70	19 38	20 51	23 19	10 13	11 47	13 18	14 46
68	19 28	20 32	22 13	10 03	11 31	12 55	14 14
66	19 19	20 17	21 40	09 55	11 18	12 37	13 51
64	19 12	20 05	21 16	09 48	11 07	12 22	13 33
62	19 06	19 54	20 58	09 42	10 58	12 10	13 18
60	19 01	19 46	20 43	09 37	10 50	12 00	13 05
N 58	18 56	19 38	20 31	09 32	10 43	11 51	12 55
56	18 52	19 31	20 20	09 28	10 37	11 43	12 45
54	18 49	19 26	20 11	09 25	10 32	11 36	12 37
52	18 45	19 20	20 03	09 21	10 27	11 30	12 30
50	18 42	19 16	19 56	09 18	10 23	11 24	12 23
45	18 36	19 06	19 42	09 12	10 13	11 12	12 09
N 40	18 30	18 58	19 31	09 06	10 05	11 02	11 57
35	18 26	18 51	19 22	09 02	09 58	10 53	11 47
30	18 22	18 46	19 14	08 58	09 52	10 46	11 38
20	18 15	18 37	19 03	08 51	09 42	10 33	11 23
N 10	18 09	18 30	18 54	08 44	09 33	10 21	11 10
0	18 03	18 24	18 48	08 39	09 25	10 11	10 57
S 10	17 57	18 19	18 43	08 33	09 16	10 00	10 45
20	17 52	18 14	18 40	08 27	09 07	09 49	10 32
30	17 45	18 09	18 37	08 20	08 57	09 36	10 17
35	17 42	18 07	18 37	08 16	08 51	09 29	10 08
40	17 38	18 05	18 36	08 11	08 45	09 20	09 58
45	17 33	18 03	18 37	08 06	08 37	09 10	09 46
S 50	17 27	18 00	18 37	07 59	08 28	08 58	09 32
52	17 25	17 59	18 38	07 57	08 23	08 53	09 26
54	17 22	17 58	18 39	07 53	08 19	08 47	09 19
56	17 19	17 56	18 40	07 50	08 14	08 40	09 10
58	17 16	17 55	18 41	07 46	08 08	08 32	09 01
S 60	17 12	17 54	18 42	07 42	08 01	08 24	08 51

Day	SUN Eqn. of Time 00ʰ	SUN Eqn. of Time 12ʰ	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
	m s	m s	h m	h m	h m	d	
1	00 09	00 00	12 00	02 28	14 51	18	◑
2	00 10	00 20	12 00	03 14	15 37	19	
3	00 29	00 39	11 59	04 00	16 23	20	

1977 SEPTEMBER 4, 5, 6 (SUN., MON., TUES.)

G.M.T.	ARIES	VENUS −3.4		MARS +1.0		JUPITER −1.8		SATURN +0.7	
	G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
d h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
4 00	343 00.0	213 01.7	N18 22.7	250 59.7	N23 30.9	250 32.0	N23 01.5	197 09.6	N14 47.5
01	358 02.5	228 01.1	22.1	266 00.5	30.9	265 34.0	01.5	212 11.8	47.4
02	13 04.9	243 00.5	21.5	281 01.2	30.9	280 36.1	01.5	227 13.9	47.3
03	28 07.4	257 59.9	·· 20.8	296 02.0	·· 30.9	295 38.2	·· 01.5	242 16.1	·· 47.2
04	43 09.9	272 59.3	20.2	311 02.8	31.0	310 40.3	01.5	257 18.2	47.1
05	58 12.3	287 58.7	19.6	326 03.6	31.0	325 42.3	01.5	272 20.4	47.0
06	73 14.8	302 58.1	N18 18.9	341 04.4	N23 31.0	340 44.4	N23 01.5	287 22.6	N14 46.9
07	88 17.3	317 57.5	18.3	356 05.2	31.0	355 46.5	01.5	302 24.7	46.8
08	103 19.7	332 56.9	17.7	11 06.0	31.0	10 48.6	01.5	317 26.9	46.7
S 09	118 22.2	347 56.3	·· 17.0	26 06.8	·· 31.1	25 50.7	·· 01.5	332 29.0	·· 46.6
U 10	133 24.6	2 55.7	16.4	41 07.6	31.1	40 52.7	01.5	347 31.2	46.5
N 11	148 27.1	17 55.1	15.7	56 08.4	31.1	55 54.8	01.5	2 33.4	46.5
D 12	163 29.6	32 54.5	N18 15.1	71 09.2	N23 31.1	70 56.9	N23 01.5	17 35.5	N14 46.4
A 13	178 32.0	47 53.9	14.4	86 10.0	31.2	85 59.0	01.5	32 37.7	46.3
Y 14	193 34.5	62 53.3	13.8	101 10.8	31.2	101 01.1	01.5	47 39.8	46.2
15	208 37.0	77 52.7	·· 13.2	116 11.6	·· 31.2	116 03.1	·· 01.5	62 42.0	·· 46.1
16	223 39.4	92 52.0	12.5	131 12.4	31.2	131 05.2	01.5	77 44.2	46.0
17	238 41.9	107 51.4	11.9	146 13.2	31.2	146 07.3	01.5	92 46.3	45.9
18	253 44.4	122 50.8	N18 11.2	161 14.0	N23 31.3	161 09.4	N23 01.5	107 48.5	N14 45.8
19	268 46.8	137 50.2	10.6	176 14.8	31.3	176 11.5	01.5	122 50.6	45.7
20	283 49.3	152 49.6	09.9	191 15.6	31.3	191 13.5	01.5	137 52.8	45.6
21	298 51.8	167 49.0	·· 09.3	206 16.4	·· 31.3	206 15.6	·· 01.5	152 55.0	·· 45.5
22	313 54.2	182 48.4	08.6	221 17.2	31.3	221 17.7	01.4	167 57.1	45.4
23	328 56.7	197 47.8	08.0	236 18.0	31.3	236 19.8	01.4	182 59.3	45.3
5 00	343 59.1	212 47.2	N18 07.3	251 18.8	N23 31.4	251 21.9	N23 01.4	198 01.5	N14 45.2
01	359 01.6	227 46.6	06.6	266 19.6	31.4	266 24.0	01.4	213 03.6	45.1
02	14 04.1	242 46.0	06.0	281 20.4	31.4	281 26.0	01.4	228 05.8	45.0
03	29 06.5	257 45.4	·· 05.3	296 21.2	·· 31.4	296 28.1	·· 01.4	243 07.9	·· 44.9
04	44 09.0	272 44.8	04.7	311 22.0	31.4	311 30.2	01.4	258 10.1	44.8
05	59 11.5	287 44.2	04.0	326 22.8	31.4	326 32.3	01.4	273 12.3	44.7
06	74 13.9	302 43.6	N18 03.4	341 23.6	N23 31.5	341 34.4	N23 01.4	288 14.4	N14 44.6
07	89 16.4	317 43.0	02.7	356 24.4	31.5	356 36.5	01.4	303 16.6	44.5
08	104 18.9	332 42.4	02.0	11 25.2	31.5	11 38.5	01.4	318 18.7	44.4
M 09	119 21.3	347 41.8	·· 01.4	26 26.0	·· 31.5	26 40.6	·· 01.4	333 20.9	·· 44.3
O 10	134 23.8	2 41.2	00.7	41 26.8	31.5	41 42.7	01.4	348 23.1	44.2
N 11	149 26.3	17 40.6	18 00.0	56 27.6	31.5	56 44.8	01.4	3 25.2	44.1
D 12	164 28.7	32 40.0	N17 59.4	71 28.4	N23 31.6	71 46.9	N23 01.4	18 27.4	N14 44.0
A 13	179 31.2	47 39.4	58.7	86 29.2	31.6	86 49.0	01.4	33 29.6	43.9
Y 14	194 33.6	62 38.8	58.1	101 30.0	31.6	101 51.1	01.4	48 31.7	43.8
15	209 36.1	77 38.2	·· 57.4	116 30.8	·· 31.6	116 53.1	·· 01.4	63 33.9	·· 43.7
16	224 38.6	92 37.6	56.7	131 31.6	31.6	131 55.2	01.4	78 36.0	43.6
17	239 41.0	107 37.0	56.0	146 32.4	31.6	146 57.3	01.4	93 38.2	43.5
18	254 43.5	122 36.4	N17 55.4	161 33.2	N23 31.6	161 59.4	N23 01.4	108 40.4	N14 43.4
19	269 46.0	137 35.8	54.7	176 34.0	31.6	177 01.5	01.3	123 42.5	43.3
20	284 48.4	152 35.2	54.0	191 34.8	31.7	192 03.6	01.3	138 44.7	43.2
21	299 50.9	167 34.6	·· 53.4	206 35.6	·· 31.7	207 05.7	·· 01.3	153 46.8	·· 43.1
22	314 53.4	182 34.0	52.7	221 36.4	31.7	222 07.7	01.3	168 49.0	43.0
23	329 55.8	197 33.4	52.0	236 37.2	31.7	237 09.8	01.3	183 51.2	42.9
6 00	344 58.3	212 32.8	N17 51.3	251 38.0	N23 31.7	252 11.9	N23 01.3	198 53.3	N14 42.9
01	0 00.7	227 32.2	50.7	266 38.8	31.7	267 14.0	01.3	213 55.5	42.8
02	15 03.2	242 31.6	50.0	281 39.6	31.7	282 16.1	01.3	228 57.7	42.7
03	30 05.7	257 31.0	·· 49.3	296 40.5	·· 31.7	297 18.2	·· 01.3	243 59.8	·· 42.6
04	45 08.1	272 30.4	48.6	311 41.3	31.7	312 20.3	01.3	259 02.0	42.5
05	60 10.6	287 29.8	47.9	326 42.1	31.8	327 22.4	01.3	274 04.1	42.4
06	75 13.1	302 29.3	N17 47.3	341 42.9	N23 31.8	342 24.5	N23 01.3	289 06.3	N14 42.3
07	90 15.5	317 28.7	46.6	356 43.7	31.8	357 26.5	01.3	304 08.5	42.2
T 08	105 18.0	332 28.1	45.9	11 44.5	31.8	12 28.6	01.3	319 10.6	42.1
U 09	120 20.5	347 27.5	·· 45.2	26 45.3	·· 31.8	27 30.7	·· 01.3	334 12.8	·· 42.0
E 10	135 22.9	2 26.9	44.5	41 46.1	31.8	42 32.8	01.3	349 15.0	41.9
S 11	150 25.4	17 26.3	43.9	56 46.9	31.8	57 34.9	01.3	4 17.1	41.8
D 12	165 27.9	32 25.7	N17 43.2	71 47.7	N23 31.8	72 37.0	N23 01.3	19 19.3	N14 41.7
A 13	180 30.3	47 25.1	42.5	86 48.5	31.8	87 39.1	01.3	34 21.5	41.6
Y 14	195 32.8	62 24.5	41.8	101 49.3	31.8	102 41.2	01.3	49 23.6	41.5
15	210 35.2	77 23.9	·· 41.1	116 50.1	·· 31.8	117 43.3	·· 01.2	64 25.8	·· 41.4
16	225 37.7	92 23.3	40.4	131 51.0	31.8	132 45.4	01.2	79 27.9	41.3
17	240 40.2	107 22.7	39.7	146 51.8	31.9	147 47.5	01.2	94 30.1	41.2
18	255 42.6	122 22.1	N17 39.0	161 52.6	N23 31.9	162 49.6	N23 01.2	109 32.3	N14 41.1
19	270 45.1	137 21.5	38.3	176 53.4	31.9	177 51.6	01.2	124 34.4	41.0
20	285 47.6	152 20.9	37.6	191 54.2	31.9	192 53.7	01.2	139 36.6	40.9
21	300 50.0	167 20.4	·· 37.0	206 55.0	·· 31.9	207 55.8	·· 01.2	154 38.8	·· 40.8
22	315 52.5	182 19.8	36.3	221 55.8	31.9	222 57.9	01.2	169 40.9	40.7
23	330 55.0	197 19.2	35.6	236 56.6	31.9	238 00.0	01.2	184 43.1	40.6
Mer. Pass.	h m 1 03.9	v −0.6	d 0.7	v 0.8	d 0.0	v 2.1	d 0.0	v 2.2	d 0.1

STARS		
Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 38.6	S40 23.4
Achernar	335 46.4	S57 20.8
Acrux	173 40.0	S62 58.6
Adhara	255 33.9	S28 56.4
Aldebaran	291 20.3	N16 27.8
Alioth	166 44.9	N56 05.1
Alkaid	153 20.5	N49 25.7
Al Na'ir	28 17.1	S47 04.0
Alnilam	276 13.8	S 1 12.9
Alphard	218 22.9	S 8 33.6
Alphecca	126 34.0	N26 47.7
Alpheratz	358 11.1	N28 58.1
Altair	62 34.3	N 8 48.8
Ankaa	353 41.9	S42 25.4
Antares	112 59.4	S26 22.9
Arcturus	146 20.5	N19 18.1
Atria	108 25.4	S68 59.5
Avior	234 29.5	S59 26.1
Bellatrix	279 01.0	N 6 19.8
Betelgeuse	271 30.6	N 7 24.2
Canopus	264 08.3	S52 40.8
Capella	281 14.3	N45 58.3
Deneb	49 49.4	N45 12.3
Denebola	183 01.4	N14 41.9
Diphda	349 22.6	S18 06.4
Dubhe	194 25.4	N61 52.3
Elnath	278 46.8	N28 35.2
Eltanin	90 58.5	N51 29.9
Enif	34 13.3	N 9 46.6
Fomalhaut	15 53.3	S29 44.3
Gacrux	172 31.4	S56 59.4
Gienah	176 20.3	S17 25.0
Hadar	149 26.6	S60 16.1
Hamal	328 31.0	N23 21.4
Kaus Aust.	84 19.4	S34 23.7
Kochab	137 19.6	N74 15.2
Markab	14 04.9	N15 05.3
Menkar	314 43.1	N 4 00.2
Menkent	148 39.6	S36 15.6
Miaplacidus	221 46.1	S69 37.5
Mirfak	309 18.8	N49 46.8
Nunki	76 31.5	S26 19.4
Peacock	54 01.2	S56 48.4
Pollux	244 00.9	N28 04.7
Procyon	245 28.1	N 5 17.0
Rasalhague	96 31.4	N12 34.8
Regulus	208 12.5	N12 04.6
Rigel	281 38.0	S 8 13.5
Rigil Kent.	140 28.8	S60 44.7
Sabik	102 43.4	S15 41.7
Schedar	350 10.7	N56 24.9
Shaula	96 58.4	S37 05.3
Sirius	258 57.7	S16 41.1
Spica	158 59.9	S11 02.6
Suhail	223 12.6	S43 20.5
Vega	80 57.0	N38 46.1
Zuben'ubi	137 35.4	S15 56.9

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	228 48.1	9 49
Mars	267 19.6	7 14
Jupiter	267 22.7	7 14
Saturn	214 02.3	10 46

	G.M.T.	SUN G.H.A.	SUN Dec.	MOON G.H.A.	MOON v	MOON Dec.	MOON d	MOON H.P.
	d h	° ′	° ′	° ′	′	° ′	′	′
	4 00	180 12.3	N 7 18.4	290 44.1	12.9	N15 36.3	5.1	54.5
	01	195 12.5	17.5	305 16.0	12.8	15 41.4	5.1	54.5
	02	210 12.7	16.6	319 47.8	12.9	15 46.5	5.0	54.5
	03	225 12.9	·· 15.7	334 19.7	12.8	15 51.5	5.0	54.5
	04	240 13.1	14.7	348 51.5	12.9	15 56.5	4.9	54.5
	05	255 13.3	13.8	3 23.4	12.8	16 01.4	4.7	54.5
	06	270 13.6	N 7 12.9	17 55.2	12.8	N16 06.1	4.8	54.4
	07	285 13.8	12.0	32 27.0	12.8	16 10.9	4.6	54.4
	08	300 14.0	11.0	46 58.8	12.8	16 15.5	4.6	54.4
S	09	315 14.2	·· 10.1	61 30.6	12.8	16 20.1	4.5	54.4
U	10	330 14.4	09.2	76 02.4	12.7	16 24.6	4.4	54.4
N	11	345 14.6	08.3	90 34.1	12.8	16 29.0	4.3	54.4
D	12	0 14.8	N 7 07.4	105 05.9	12.7	N16 33.3	4.3	54.4
A	13	15 15.0	06.4	119 37.6	12.8	16 37.6	4.2	54.4
Y	14	30 15.2	05.5	134 09.4	12.7	16 41.8	4.1	54.4
	15	45 15.4	·· 04.6	148 41.1	12.7	16 45.9	4.0	54.4
	16	60 15.6	03.7	163 12.8	12.7	16 49.9	4.0	54.3
	17	75 15.8	02.7	177 44.5	12.7	16 53.9	3.8	54.3
	18	90 16.0	N 7 01.8	192 16.2	12.6	N16 57.7	3.8	54.3
	19	105 16.2	00.9	206 47.8	12.7	17 01.5	3.8	54.3
	20	120 16.4	7 00.0	221 19.5	12.7	17 05.3	3.6	54.3
	21	135 16.7	6 59.0	235 51.2	12.6	17 08.9	3.6	54.3
	22	150 16.9	58.1	250 22.8	12.6	17 12.5	3.4	54.3
	23	165 17.1	57.2	264 54.4	12.6	17 15.9	3.4	54.3
	5 00	180 17.3	N 6 56.3	279 26.0	12.6	N17 19.3	3.4	54.3
	01	195 17.5	55.3	293 57.6	12.6	17 22.7	3.2	54.3
	02	210 17.7	54.4	308 29.2	12.6	17 25.9	3.2	54.3
	03	225 17.9	·· 53.5	323 00.8	12.6	17 29.1	3.1	54.3
	04	240 18.1	52.6	337 32.4	12.5	17 32.2	3.0	54.3
	05	255 18.3	51.6	352 03.9	12.6	17 35.2	2.9	54.3
	06	270 18.5	N 6 50.7	6 35.5	12.5	N17 38.1	2.8	54.3
	07	285 18.7	49.8	21 07.0	12.5	17 40.9	2.8	54.3
	08	300 18.9	48.9	35 38.5	12.5	17 43.7	2.7	54.3
M	09	315 19.1	·· 47.9	50 10.0	12.5	17 46.4	2.6	54.3
O	10	330 19.4	47.0	64 41.5	12.5	17 49.0	2.5	54.3
N	11	345 19.6	46.1	79 13.0	12.5	17 51.5	2.4	54.3
D	12	0 19.8	N 6 45.1	93 44.5	12.4	N17 53.9	2.4	54.3
A	13	15 20.0	44.2	108 15.9	12.5	17 56.3	2.3	54.2
Y	14	30 20.2	43.3	122 47.4	12.4	17 58.6	2.1	54.2
	15	45 20.4	·· 42.4	137 18.8	12.4	18 00.7	2.2	54.2
	16	60 20.6	41.4	151 50.2	12.4	18 02.9	2.0	54.2
	17	75 20.8	40.5	166 21.6	12.4	18 04.9	1.9	54.2
	18	90 21.0	N 6 39.6	180 53.0	12.4	N18 06.8	1.9	54.2
	19	105 21.2	38.6	195 24.4	12.4	18 08.7	1.8	54.2
	20	120 21.4	37.7	209 55.8	12.4	18 10.5	1.6	54.2
	21	135 21.7	·· 36.8	224 27.2	12.3	18 12.1	1.7	54.2
	22	150 21.9	35.9	238 58.5	12.4	18 13.8	1.5	54.2
	23	165 22.1	34.9	253 29.9	12.3	18 15.3	1.4	54.2
	6 00	180 22.3	N 6 34.0	268 01.2	12.3	N18 16.7	1.4	54.2
	01	195 22.5	33.1	282 32.5	12.3	18 18.1	1.3	54.3
	02	210 22.7	32.1	297 03.8	12.3	18 19.4	1.1	54.3
	03	225 22.9	·· 31.2	311 35.1	12.3	18 20.5	1.2	54.3
	04	240 23.1	30.3	326 06.4	12.3	18 21.7	1.0	54.3
	05	255 23.3	29.3	340 37.7	12.3	18 22.7	0.9	54.3
	06	270 23.5	N 6 28.4	355 09.0	12.2	N18 23.6	0.9	54.3
	07	285 23.8	27.5	9 40.2	12.3	18 24.5	0.7	54.3
	08	300 24.0	26.6	24 11.5	12.2	18 25.2	0.7	54.3
T	09	315 24.2	·· 25.6	38 42.7	12.3	18 25.9	0.6	54.3
U	10	330 24.4	24.7	53 14.0	12.2	18 26.5	0.5	54.3
E	11	345 24.6	23.8	67 45.2	12.2	18 27.0	0.4	54.3
S	12	0 24.8	N 6 22.8	82 16.4	12.2	N18 27.4	0.4	54.3
D	13	15 25.0	21.9	96 47.6	12.2	18 27.8	0.2	54.3
A	14	30 25.2	21.0	111 18.8	12.2	18 28.0	0.2	54.3
Y	15	45 25.4	·· 20.0	125 50.0	12.2	18 28.2	0.1	54.3
	16	60 25.7	19.1	140 21.2	12.1	18 28.3	0.0	54.3
	17	75 25.9	18.2	154 52.3	12.2	18 28.3	0.1	54.3
	18	90 26.1	N 6 17.2	169 23.5	12.1	N18 28.2	0.2	54.3
	19	105 26.3	16.3	183 54.6	12.2	18 28.0	0.2	54.3
	20	120 26.5	15.4	198 25.8	12.1	18 27.8	0.3	54.3
	21	135 26.7	·· 14.4	212 56.9	12.1	18 27.5	0.5	54.4
	22	150 26.9	13.5	227 28.0	12.1	18 27.0	0.5	54.4
	23	165 27.1	12.6	241 59.1	12.2	18 26.5	0.6	54.4
		S.D. 15.9	*d* 0.9	S.D. 14.8		14.8		14.8

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 4	Moonrise 5	Moonrise 6	Moonrise 7
°	h m	h m	h m	h m	h m	h m	h m
N 72	////	02 57	04 20	18 35	□	□	20 05
N 70	01 15	03 20	04 31	19 26	19 45	20 24	21 29
68	02 02	03 37	04 40	19 58	20 25	21 08	22 07
66	02 31	03 51	04 47	20 22	20 53	21 37	22 34
64	02 53	04 02	04 54	20 40	21 14	21 59	22 55
62	03 10	04 12	04 59	20 56	21 31	22 16	23 11
60	03 23	04 20	05 04	21 08	21 46	22 31	23 25
N 58	03 35	04 27	05 08	21 20	21 58	22 43	23 37
56	03 44	04 33	05 12	21 29	22 08	22 54	23 47
54	03 53	04 38	05 15	21 38	22 18	23 04	23 56
52	04 00	04 43	05 18	21 45	22 26	23 12	24 04
50	04 07	04 47	05 21	21 52	22 33	23 20	24 12
45	04 20	04 56	05 26	22 07	22 49	23 36	24 27
N 40	04 31	05 04	05 31	22 19	23 02	23 49	24 40
35	04 39	05 10	05 35	22 30	23 13	24 01	00 01
30	04 46	05 15	05 39	22 39	23 23	24 10	00 10
20	04 57	05 23	05 45	22 55	23 40	24 27	00 27
N 10	05 05	05 29	05 51	23 08	23 55	24 42	00 42
0	05 10	05 35	05 55	23 21	24 09	00 09	00 56
S 10	05 15	05 39	06 00	23 34	24 22	00 22	01 10
20	05 18	05 43	06 05	23 48	24 37	00 37	01 25
30	05 19	05 47	06 11	24 04	00 04	00 54	01 42
35	05 19	05 49	06 14	24 14	00 14	01 04	01 52
40	05 19	05 50	06 17	24 24	00 24	01 15	02 03
45	05 18	05 52	06 22	24 37	00 37	01 29	02 17
S 50	05 17	05 54	06 26	24 52	00 52	01 45	02 33
52	05 16	05 55	06 29	00 02	00 59	01 52	02 41
54	05 15	05 56	06 31	00 09	01 07	02 01	02 49
56	05 14	05 56	06 34	00 16	01 16	02 11	02 59
58	05 12	05 57	06 37	00 25	01 26	02 21	03 10
S 60	05 10	05 58	06 40	00 35	01 38	02 34	03 22

Lat.	Sunset	Twilight Civil	Twilight Naut.	Moonset 4	Moonset 5	Moonset 6	Moonset 7
°	h m	h m	h m	h m	h m	h m	h m
N 72	19 34	20 55	////	15 37	□	□	19 02
N 70	19 24	20 34	22 32	14 46	16 05	17 04	17 39
68	19 15	20 17	21 49	14 14	15 24	16 20	17 00
66	19 08	20 04	21 22	13 51	14 57	15 51	16 33
64	19 02	19 53	21 01	13 33	14 36	15 29	16 12
62	18 57	19 44	20 45	13 18	14 19	15 12	15 55
60	18 52	19 36	20 32	13 05	14 05	14 57	15 41
N 58	18 48	19 29	20 21	12 55	13 53	14 45	15 29
56	18 45	19 23	20 11	12 45	13 42	14 34	15 19
54	18 41	19 18	20 03	12 37	13 33	14 24	15 09
52	18 38	19 13	19 56	12 30	13 25	14 16	15 01
50	18 36	19 09	19 49	12 23	13 18	14 08	14 54
45	18 30	19 00	19 36	12 09	13 02	13 52	14 38
N 40	18 25	18 53	19 26	11 57	12 49	13 39	14 25
35	18 21	18 47	19 17	11 47	12 38	13 27	14 14
30	18 18	18 42	19 11	11 38	12 29	13 17	14 04
20	18 12	18 34	19 00	11 23	12 12	13 00	13 48
N 10	18 07	18 28	18 53	11 10	11 58	12 45	13 33
0	18 02	18 23	18 47	10 57	11 44	12 32	13 19
S 10	17 57	18 18	18 43	10 45	11 31	12 18	13 06
20	17 52	18 15	18 40	10 32	11 16	12 03	12 51
30	17 47	18 11	18 39	10 17	11 00	11 46	12 34
35	17 44	18 09	18 39	10 08	10 50	11 36	12 24
40	17 41	18 08	18 39	09 58	10 39	11 24	12 13
45	17 37	18 06	18 40	09 46	10 26	11 11	12 00
S 50	17 32	18 04	18 42	09 32	10 11	10 54	11 44
52	17 30	18 04	18 43	09 26	10 03	10 47	11 36
54	17 27	18 03	18 44	09 19	09 55	10 38	11 28
56	17 25	18 02	18 45	09 10	09 46	10 29	11 18
58	17 22	18 01	18 47	09 01	09 36	10 18	11 07
S 60	17 19	18 00	18 49	08 51	09 24	10 05	10 55

Day	SUN Eqn. of Time 00ʰ	SUN Eqn. of Time 12ʰ	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
	m s	m s	h m	h m	h m	d	
4	00 49	00 59	11 59	04 46	17 09	21	◑
5	01 09	01 19	11 59	05 33	17 56	22	
6	01 29	01 39	11 58	06 20	18 44	23	

G.M.T.		ARIES	VENUS −3.4		MARS +1.0		JUPITER −1.8		SATURN +0.7	
		G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
d	h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
7	00	345 57.4	212 18.6	N17 34.9	251 57.4	N23 31.9	253 02.1	N23 01.2	199 45.2	N14 40.5
	01	0 59.9	227 18.0	34.2	266 58.3	31.9	268 04.2	01.2	214 47.4	40.4
	02	16 02.4	242 17.4	33.5	281 59.1	31.9	283 06.3	01.2	229 49.6	40.3
	03	31 04.8	257 16.8	·· 32.8	296 59.9	·· 31.9	298 08.4	·· 01.2	244 51.7	·· 40.2
	04	46 07.3	272 16.2	32.1	312 00.7	31.9	313 10.5	01.2	259 53.9	40.1
	05	61 09.7	287 15.6	31.4	327 01.5	31.9	328 12.6	01.2	274 56.1	40.0
	06	76 12.2	302 15.0	N17 30.7	342 02.3	N23 31.9	343 14.7	N23 01.2	289 58.2	N14 39.9
WEDNESDAY	07	91 14.7	317 14.5	30.0	357 03.1	31.9	358 16.8	01.2	305 00.4	39.8
	08	106 17.1	332 13.9	29.3	12 03.9	31.9	13 18.9	01.2	320 02.6	39.7
	09	121 19.6	347 13.3	·· 28.6	27 04.8	·· 31.9	28 21.0	·· 01.2	335 04.7	·· 39.7
	10	136 22.1	2 12.7	27.9	42 05.6	31.9	43 23.1	01.2	350 06.9	39.6
	11	151 24.5	17 12.1	27.2	57 06.4	31.9	58 25.2	01.1	5 09.0	39.5
	12	166 27.0	32 11.5	N17 26.4	72 07.2	N23 31.9	73 27.3	N23 01.1	20 11.2	N14 39.4
	13	181 29.5	47 10.9	25.7	87 08.0	31.9	88 29.4	01.1	35 13.4	39.3
	14	196 31.9	62 10.3	25.0	102 08.8	31.9	103 31.5	01.1	50 15.5	39.2
	15	211 34.4	77 09.8	·· 24.3	117 09.6	·· 31.9	118 33.6	·· 01.1	65 17.7	·· 39.1
	16	226 36.8	92 09.2	23.6	132 10.5	31.9	133 35.7	01.1	80 19.9	39.0
	17	241 39.3	107 08.6	22.9	147 11.3	31.9	148 37.8	01.1	95 22.0	38.9
	18	256 41.8	122 08.0	N17 22.2	162 12.1	N23 31.9	163 39.9	N23 01.1	110 24.2	N14 38.8
	19	271 44.2	137 07.4	21.5	177 12.9	31.9	178 42.0	01.1	125 26.4	38.7
	20	286 46.7	152 06.8	20.8	192 13.7	31.9	193 44.1	01.1	140 28.5	38.6
	21	301 49.2	167 06.2	·· 20.0	207 14.5	·· 31.9	208 46.2	·· 01.1	155 30.7	·· 38.5
	22	316 51.6	182 05.7	19.3	222 15.4	31.9	223 48.3	01.1	170 32.9	38.4
	23	331 54.1	197 05.1	18.6	237 16.2	31.9	238 50.4	01.1	185 35.0	38.3
8	00	346 56.6	212 04.5	N17 17.9	252 17.0	N23 31.9	253 52.5	N23 01.1	200 37.2	N14 38.2
	01	1 59.0	227 03.9	17.2	267 17.8	31.9	268 54.6	01.1	215 39.4	38.1
	02	17 01.5	242 03.3	16.5	282 18.6	31.9	283 56.7	01.1	230 41.5	38.0
	03	32 04.0	257 02.7	·· 15.7	297 19.5	·· 31.9	298 58.8	·· 01.1	245 43.7	·· 37.9
	04	47 06.4	272 02.2	15.0	312 20.3	31.9	314 00.9	01.1	260 45.8	37.8
	05	62 08.9	287 01.6	14.3	327 21.1	31.9	329 03.0	01.0	275 48.0	37.7
	06	77 11.3	302 01.0	N17 13.6	342 21.9	N23 31.9	344 05.1	N23 01.0	290 50.2	N14 37.6
	07	92 13.8	317 00.4	12.9	357 22.7	31.9	359 07.2	01.0	305 52.3	37.5
THURSDAY	08	107 16.3	331 59.8	12.1	12 23.6	31.9	14 09.3	01.0	320 54.5	37.4
	09	122 18.7	346 59.2	·· 11.4	27 24.4	·· 31.9	29 11.4	·· 01.0	335 56.7	·· 37.3
	10	137 21.2	1 58.7	10.7	42 25.2	31.9	44 13.5	01.0	350 58.8	37.2
	11	152 23.7	16 58.1	10.0	57 26.0	31.9	59 15.6	01.0	6 01.0	37.1
	12	167 26.1	31 57.5	N17 09.2	72 26.8	N23 31.9	74 17.7	N23 01.0	21 03.2	N14 37.0
	13	182 28.6	46 56.9	08.5	87 27.7	31.9	89 19.8	01.0	36 05.3	36.9
	14	197 31.1	61 56.3	07.8	102 28.5	31.9	104 21.9	01.0	51 07.5	36.9
	15	212 33.5	76 55.8	·· 07.0	117 29.3	·· 31.9	119 24.0	·· 01.0	66 09.7	·· 36.8
	16	227 36.0	91 55.2	06.3	132 30.1	31.9	134 26.1	01.0	81 11.8	36.7
	17	242 38.5	106 54.6	05.6	147 30.9	31.9	149 28.2	01.0	96 14.0	36.6
	18	257 40.9	121 54.0	N17 04.8	162 31.8	N23 31.8	164 30.3	N23 01.0	111 16.2	N14 36.5
	19	272 43.4	136 53.4	04.1	177 32.6	31.8	179 32.4	01.0	126 18.3	36.4
	20	287 45.8	151 52.9	03.4	192 33.4	31.8	194 34.5	01.0	141 20.5	36.3
	21	302 48.3	166 52.3	·· 02.6	207 34.2	·· 31.8	209 36.6	·· 01.0	156 22.7	·· 36.2
	22	317 50.8	181 51.7	01.9	222 35.1	31.8	224 38.7	01.0	171 24.8	36.1
	23	332 53.2	196 51.1	01.2	237 35.9	31.8	239 40.8	00.9	186 27.0	36.0
9	00	347 55.7	211 50.6	N17 00.4	252 36.7	N23 31.8	254 42.9	N23 00.9	201 29.2	N14 35.9
	01	2 58.2	226 50.0	16 59.7	267 37.5	31.8	269 45.0	00.9	216 31.3	35.8
	02	18 00.6	241 49.4	59.0	282 38.4	31.8	284 47.2	00.9	231 33.5	35.7
	03	33 03.1	256 48.8	·· 58.2	297 39.2	·· 31.8	299 49.3	·· 00.9	246 35.7	·· 35.6
	04	48 05.6	271 48.2	57.5	312 40.0	31.8	314 51.4	00.9	261 37.8	35.5
	05	63 08.0	286 47.7	56.7	327 40.8	31.8	329 53.5	00.9	276 40.0	35.4
	06	78 10.5	301 47.1	N16 56.0	342 41.7	N23 31.7	344 55.6	N23 00.9	291 42.2	N14 35.3
	07	93 12.9	316 46.5	55.2	357 42.5	31.7	359 57.7	00.9	306 44.3	35.2
	08	108 15.4	331 45.9	54.5	12 43.3	31.7	14 59.8	00.9	321 46.5	35.1
FRIDAY	09	123 17.9	346 45.4	·· 53.8	27 44.1	·· 31.7	30 01.9	·· 00.9	336 48.7	·· 35.0
	10	138 20.3	1 44.8	53.0	42 45.0	31.7	45 04.0	00.9	351 50.8	34.9
	11	153 22.8	16 44.2	52.3	57 45.8	31.7	60 06.1	00.9	6 53.0	34.8
	12	168 25.3	31 43.6	N16 51.5	72 46.6	N23 31.7	75 08.2	N23 00.9	21 55.2	N14 34.7
	13	183 27.7	46 43.1	50.8	87 47.5	31.7	90 10.3	00.9	36 57.3	34.6
	14	198 30.2	61 42.5	50.0	102 48.3	31.7	105 12.5	00.9	51 59.5	34.5
	15	213 32.7	76 41.9	·· 49.3	117 49.1	·· 31.7	120 14.6	·· 00.9	67 01.7	·· 34.4
	16	228 35.1	91 41.3	48.5	132 49.9	31.6	135 16.7	00.9	82 03.8	34.3
	17	243 37.6	106 40.8	47.8	147 50.8	31.6	150 18.8	00.8	97 06.0	34.3
	18	258 40.1	121 40.2	N16 47.0	162 51.6	N23 31.6	165 20.9	N23 00.8	112 08.2	N14 34.2
	19	273 42.5	136 39.6	46.3	177 52.4	31.6	180 23.0	00.8	127 10.3	34.1
	20	288 45.0	151 39.1	45.5	192 53.3	31.6	195 25.1	00.8	142 12.5	34.0
	21	303 47.4	166 38.5	·· 44.7	207 54.1	·· 31.6	210 27.2	·· 00.8	157 14.7	·· 33.9
	22	318 49.9	181 37.9	44.0	222 54.9	31.6	225 29.3	00.8	172 16.8	33.8
	23	333 52.4	196 37.3	43.2	237 55.8	31.5	240 31.5	00.8	187 19.0	33.7
Mer. Pass.		h m 0 52.1	v 0.6	d 0.7	v 0.8	d 0.0	v 2.1	d 0.0	v 2.2	d 0.1

STARS		
Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 38.6	S40 23.4
Achernar	335 46.4	S57 20.8
Acrux	173 40.0	S62 58.6
Adhara	255 33.9	S28 56.4
Aldebaran	291 20.3	N16 27.9
Alioth	166 44.9	N56 05.0
Alkaid	153 20.5	N49 25.7
Al Na'ir	28 17.1	S47 04.0
Alnilam	276 13.8	S 1 12.9
Alphard	218 22.8	S 8 33.6
Alphecca	126 34.0	N26 47.7
Alpheratz	358 11.0	N28 58.1
Altair	62 34.3	N 8 48.8
Ankaa	353 41.9	S42 25.4
Antares	112 59.4	S26 22.9
Arcturus	146 20.5	N19 18.1
Atria	108 25.4	S68 59.5
Avior	234 29.4	S59 26.1
Bellatrix	279 01.0	N 6 19.8
Betelgeuse	271 30.5	N 7 24.2
Canopus	264 08.3	S52 40.8
Capella	281 14.3	N45 58.3
Deneb	49 49.4	N45 12.4
Denebola	183 01.4	N14 41.9
Diphda	349 22.6	S18 06.4
Dubhe	194 25.4	N61 52.3
Elnath	278 46.7	N28 35.2
Eltanin	90 58.5	N51 29.9
Enif	34 13.3	N 9 46.6
Fomalhaut	15 53.3	S29 44.3
Gacrux	172 31.4	S56 59.4
Gienah	176 20.3	S17 25.0
Hadar	149 26.6	S60 16.1
Hamal	328 31.0	N23 21.4
Kaus Aust.	84 19.4	S34 23.7
Kochab	137 19.7	N74 15.2
Markab	14 04.8	N15 05.3
Menkar	314 43.1	N 4 00.2
Menkent	148 39.6	S36 15.6
Miaplacidus	221 46.1	S69 37.5
Mirfak	309 18.8	N49 46.8
Nunki	76 31.5	S26 19.4
Peacock	54 01.2	S56 48.4
Pollux	244 00.9	N28 04.7
Procyon	245 28.1	N 5 17.0
Rasalhague	96 31.4	N12 34.8
Regulus	208 12.5	N12 04.6
Rigel	281 38.0	S 8 13.5
Rigil Kent.	140 28.9	S60 44.7
Sabik	102 43.4	S15 41.7
Schedar	350 10.7	N56 24.9
Shaula	96 58.4	S37 05.3
Sirius	258 57.6	S16 41.0
Spica	158 59.9	S11 02.6
Suhail	223 12.6	S43 20.4
Vega	80 57.0	N38 46.2
Zuben'ubi	137 35.4	S15 56.9

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	225 07.9	9 52
Mars	265 20.4	7 10
Jupiter	266 55.9	7 04
Saturn	213 40.6	10 36

	G.M.T.	SUN G.H.A.	SUN Dec.	MOON G.H.A.	MOON v	MOON Dec.	MOON d	MOON H.P.
	d h	° ′	° ′	° ′	′	° ′	′	′
	7 00	180 27.3	N 6 11.6	256 30.3	12.1	N18 25.9	0.7	54.4
	01	195 27.6	10.7	271 01.4	12.1	18 25.2	0.7	54.4
	02	210 27.8	09.8	285 32.5	12.0	18 24.5	0.9	54.4
	03	225 28.0	·· 08.8	300 03.5	12.1	18 23.6	1.0	54.4
	04	240 28.2	07.9	314 34.6	12.1	18 22.6	1.0	54.4
	05	255 28.4	07.0	329 05.7	12.1	18 21.6	1.1	54.4
	06	270 28.6	N 6 06.0	343 36.8	12.0	N18 20.5	1.2	54.4
W	07	285 28.8	05.1	358 07.8	12.1	18 19.3	1.3	54.4
E	08	300 29.0	04.1	12 38.9	12.0	18 18.0	1.4	54.5
D	09	315 29.3	·· 03.2	27 09.9	12.0	18 16.6	1.4	54.5
N	10	330 29.5	02.3	41 40.9	12.1	18 15.2	1.6	54.5
E	11	345 29.7	01.3	56 12.0	12.0	18 13.6	1.6	54.5
S	12	0 29.9	N 6 00.4	70 43.0	12.0	N18 12.0	1.7	54.5
D	13	15 30.1	5 59.5	85 14.0	12.0	18 10.3	1.8	54.5
A	14	30 30.3	58.5	99 45.0	12.1	18 08.5	1.9	54.5
Y	15	45 30.5	·· 57.6	114 16.1	12.0	18 06.6	2.0	54.5
	16	60 30.7	56.7	128 47.1	12.0	18 04.6	2.1	54.6
	17	75 31.0	55.7	143 18.1	12.0	18 02.5	2.1	54.6
	18	90 31.2	N 5 54.8	157 49.1	11.9	N18 00.4	2.2	54.6
	19	105 31.4	53.8	172 20.0	12.0	17 58.2	2.4	54.6
	20	120 31.6	52.9	186 51.0	12.0	17 55.8	2.4	54.6
	21	135 31.8	·· 52.0	201 22.0	12.0	17 53.4	2.5	54.6
	22	150 32.0	51.0	215 53.0	12.0	17 50.9	2.5	54.6
	23	165 32.2	50.1	230 24.0	11.9	17 48.4	2.7	54.7
	8 00	180 32.5	N 5 49.2	244 54.9	12.0	N17 45.7	2.8	54.7
	01	195 32.7	48.2	259 25.9	11.9	17 42.9	2.8	54.7
	02	210 32.9	47.3	273 56.8	12.0	17 40.1	2.9	54.7
	03	225 33.1	·· 46.3	288 27.8	11.9	17 37.2	3.0	54.7
	04	240 33.3	45.4	302 58.7	12.0	17 34.2	3.1	54.7
	05	255 33.5	44.5	317 29.7	11.9	17 31.1	3.2	54.8
	06	270 33.7	N 5 43.5	332 00.6	12.0	N17 27.9	3.2	54.8
	07	285 34.0	42.6	346 31.6	11.9	17 24.7	3.4	54.8
T	08	300 34.2	41.6	1 02.5	12.0	17 21.3	3.4	54.8
H	09	315 34.4	·· 40.7	15 33.5	11.9	17 17.9	3.5	54.8
U	10	330 34.6	39.8	30 04.4	11.9	17 14.4	3.6	54.8
R	11	345 34.8	38.8	44 35.3	12.0	17 10.8	3.7	54.9
S	12	0 35.0	N 5 37.9	59 06.3	11.9	N17 07.1	3.8	54.9
D	13	15 35.2	36.9	73 37.2	11.9	17 03.3	3.8	54.9
A	14	30 35.5	36.0	88 08.1	11.9	16 59.5	3.9	54.9
Y	15	45 35.7	·· 35.1	102 39.0	11.9	16 55.6	4.1	54.9
	16	60 35.9	34.1	117 09.9	12.0	16 51.5	4.1	54.9
	17	75 36.1	33.2	131 40.9	11.9	16 47.4	4.1	55.0
	18	90 36.3	N 5 32.2	146 11.8	11.9	N16 43.3	4.3	55.0
	19	105 36.5	31.3	160 42.7	11.9	16 39.0	4.4	55.0
	20	120 36.7	30.3	175 13.6	11.9	16 34.6	4.4	55.0
	21	135 37.0	·· 29.4	189 44.5	11.9	16 30.2	4.5	55.0
	22	150 37.2	28.5	204 15.4	11.9	16 25.7	4.6	55.1
	23	165 37.4	27.5	218 46.3	11.9	16 21.1	4.7	55.1
	9 00	180 37.6	N 5 26.6	233 17.2	11.9	N16 16.4	4.7	55.1
	01	195 37.8	25.6	247 48.1	11.9	16 11.7	4.9	55.1
	02	210 38.0	24.7	262 19.0	11.9	16 06.8	4.9	55.2
	03	225 38.2	·· 23.8	276 49.9	11.9	16 01.9	5.0	55.2
	04	240 38.5	22.8	291 20.8	11.9	15 56.9	5.1	55.2
	05	255 38.7	21.9	305 51.7	11.9	15 51.8	5.2	55.2
	06	270 38.9	N 5 20.9	320 22.6	11.9	N15 46.6	5.2	55.2
	07	285 39.1	20.0	334 53.5	11.9	15 41.4	5.3	55.3
	08	300 39.3	19.0	349 24.4	11.9	15 36.1	5.4	55.3
F	09	315 39.5	·· 18.1	3 55.3	11.9	15 30.7	5.5	55.3
R	10	330 39.8	17.1	18 26.2	11.9	15 25.2	5.6	55.3
I	11	345 40.0	16.2	32 57.1	11.9	15 19.6	5.6	55.4
D	12	0 40.2	N 5 15.3	47 28.0	11.9	N15 14.0	5.8	55.4
A	13	15 40.4	14.3	61 58.9	11.9	15 08.2	5.8	55.4
Y	14	30 40.6	13.4	76 29.8	11.9	15 02.4	5.8	55.4
	15	45 40.8	·· 12.4	91 00.7	11.9	14 56.6	6.0	55.4
	16	60 41.1	11.5	105 31.6	11.9	14 50.6	6.0	55.5
	17	75 41.3	10.5	120 02.5	11.9	14 44.6	6.1	55.5
	18	90 41.5	N 5 09.6	134 33.4	11.9	N14 38.5	6.2	55.5
	19	105 41.7	08.6	149 04.3	11.8	14 32.3	6.3	55.5
	20	120 41.9	07.7	163 35.1	11.9	14 26.0	6.3	55.6
	21	135 42.1	·· 06.8	178 06.0	11.9	14 19.7	6.4	55.6
	22	150 42.4	05.8	192 36.9	11.9	14 13.3	6.5	55.6
	23	165 42.6	04.9	207 07.8	11.9	14 06.8	6.6	55.6
		S.D. 15.9	*d* 0.9	S.D. 14.9		15.0		15.1

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 7	Moonrise 8	Moonrise 9	Moonrise 10
°	h m	h m	h m	h m	h m	h m	h m
N 72	00 31	03 15	04 34	20 05	22 06	23 55	25 42
N 70	01 46	03 35	04 43	21 29	22 52	24 24	00 24
68	02 22	03 50	04 51	22 07	23 21	24 45	00 45
66	02 47	04 02	04 57	22 34	23 44	25 02	01 02
64	03 05	04 12	05 02	22 55	24 01	00 01	01 15
62	03 20	04 20	05 07	23 11	24 15	00 15	01 27
60	03 32	04 27	05 11	23 25	24 28	00 28	01 37
N 58	03 43	04 34	05 14	23 37	24 38	00 38	01 45
56	03 52	04 39	05 17	23 47	24 47	00 47	01 53
54	03 59	04 44	05 20	23 56	24 55	00 55	01 59
52	04 06	04 48	05 23	24 04	00 04	01 02	02 05
50	04 12	04 52	05 25	24 12	00 12	01 09	02 10
45	04 24	05 00	05 30	24 27	00 27	01 23	02 22
N 40	04 34	05 07	05 34	24 40	00 40	01 34	02 32
35	04 42	05 12	05 38	00 01	00 51	01 44	02 40
30	04 48	05 16	05 41	00 10	01 00	01 53	02 47
20	04 58	05 24	05 46	00 27	01 17	02 07	02 59
N 10	05 05	05 29	05 50	00 42	01 31	02 20	03 10
0	05 10	05 34	05 54	00 56	01 44	02 32	03 20
S 10	05 13	05 37	05 58	01 10	01 57	02 44	03 30
20	05 15	05 40	06 03	01 25	02 12	02 57	03 41
30	05 16	05 43	06 07	01 42	02 28	03 12	03 54
35	05 15	05 44	06 10	01 52	02 37	03 20	04 01
40	05 14	05 46	06 13	02 03	02 48	03 30	04 09
45	05 13	05 47	06 16	02 17	03 01	03 41	04 18
S 50	05 10	05 48	06 20	02 33	03 16	03 55	04 29
52	05 09	05 48	06 22	02 41	03 23	04 01	04 35
54	05 08	05 48	06 24	02 49	03 31	04 08	04 40
56	05 06	05 49	06 26	02 59	03 40	04 16	04 47
58	05 04	05 49	06 28	03 10	03 51	04 25	04 54
S 60	05 01	05 49	06 31	03 22	04 02	04 35	05 02

Lat.	Sunset	Twilight Civil	Twilight Naut.	Moonset 7	Moonset 8	Moonset 9	Moonset 10
°	h m	h m	h m	h m	h m	h m	h m
N 72	19 18	20 36	23 01	19 02	18 42	18 33	18 27
N 70	19 09	20 17	22 01	17 39	17 56	18 03	18 07
68	19 02	20 03	21 28	17 00	17 25	17 41	17 52
66	18 56	19 51	21 05	16 33	17 03	17 24	17 39
64	18 51	19 41	20 47	16 12	16 45	17 09	17 29
62	18 47	19 33	20 33	15 55	16 30	16 57	17 20
60	18 43	19 26	20 21	15 41	16 17	16 47	17 12
N 58	18 40	19 20	20 11	15 29	16 07	16 38	17 05
56	18 37	19 15	20 02	15 19	15 57	16 30	16 59
54	18 34	19 10	19 54	15 09	15 49	16 23	16 53
52	18 32	19 06	19 48	15 01	15 41	16 17	16 48
50	18 29	19 02	19 42	14 54	15 35	16 11	16 44
45	18 25	18 54	19 30	14 38	15 20	15 59	16 34
N 40	18 21	18 48	19 20	14 25	15 08	15 48	16 26
35	18 17	18 43	19 13	14 14	14 58	15 40	16 19
30	18 14	18 38	19 07	14 04	14 49	15 32	16 13
20	18 09	18 31	18 57	13 48	14 34	15 18	16 02
N 10	18 05	18 26	18 51	13 33	14 20	15 07	15 52
0	18 01	18 22	18 46	13 19	14 07	14 55	15 43
S 10	17 57	18 18	18 43	13 06	13 55	14 44	15 34
20	17 53	18 15	18 41	12 51	13 41	14 32	15 25
30	17 49	18 13	18 40	12 34	13 25	14 18	15 14
35	17 46	18 11	18 41	12 24	13 16	14 10	15 07
40	17 43	18 10	18 42	12 13	13 05	14 01	15 00
45	17 40	18 09	18 43	12 00	12 53	13 51	14 52
S 50	17 36	18 09	18 46	11 44	12 38	13 38	14 41
52	17 35	18 08	18 47	11 36	12 31	13 32	14 36
54	17 33	18 08	18 49	11 28	12 23	13 25	14 31
56	17 31	18 08	18 51	11 18	12 15	13 17	14 25
58	17 28	18 07	18 53	11 07	12 05	13 09	14 19
S 60	17 26	18 07	18 56	10 55	11 53	12 59	14 11

Day	SUN Eqn. of Time 00ʰ	SUN Eqn. of Time 12ʰ	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
	m s	m s	h m	h m	h m	d	
7	01 49	01 59	11 58	07 08	19 32	24	
8	02 09	02 20	11 58	07 56	20 20	25	☾
9	02 30	02 40	11 57	08 44	21 08	26	

G.M.T.		ARIES	VENUS −3.4		MARS +0.9		JUPITER −1.8		SATURN +0.8	
		G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
d	h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
10	00	348 54.8	211 36.8	N16 42.5	252 56.6	N23 31.5	255 33.6	N23 00.8	202 21.2	N14 33.6
	01	3 57.3	226 36.2	41.7	267 57.4	31.5	270 35.7	00.8	217 23.3	33.5
	02	18 59.8	241 35.6	41.0	282 58.3	31.5	285 37.8	00.8	232 25.5	33.4
	03	34 02.2	256 35.1	·· 40.2	297 59.1	·· 31.5	300 39.9	·· 00.8	247 27.7	·· 33.3
	04	49 04.7	271 34.5	39.4	312 59.9	31.5	315 42.0	00.8	262 29.8	33.2
	05	64 07.2	286 33.9	38.7	328 00.8	31.5	330 44.1	00.8	277 32.0	33.1
	06	79 09.6	301 33.4	N16 37.9	343 01.6	N23 31.4	345 46.3	N23 00.8	292 34.2	N14 33.0
	07	94 12.1	316 32.8	37.2	358 02.4	31.4	0 48.4	00.8	307 36.3	32.9
S	08	109 14.6	331 32.2	36.4	13 03.3	31.4	15 50.5	00.8	322 38.5	32.8
A	09	124 17.0	346 31.6	·· 35.6	28 04.1	·· 31.4	30 52.6	·· 00.8	337 40.7	·· 32.7
T	10	139 19.5	1 31.1	34.9	43 04.9	31.4	45 54.7	00.7	352 42.8	32.6
U	11	154 21.9	16 30.5	34.1	58 05.8	31.4	60 56.8	00.7	7 45.0	32.5
R	12	169 24.4	31 29.9	N16 33.3	73 06.6	N23 31.3	75 58.9	N23 00.7	22 47.2	N14 32.4
D	13	184 26.9	46 29.4	32.6	88 07.4	31.3	91 01.1	00.7	37 49.3	32.3
A	14	199 29.3	61 28.8	31.8	103 08.3	31.3	106 03.2	00.7	52 51.5	32.2
Y	15	214 31.8	76 28.2	·· 31.0	118 09.1	·· 31.3	121 05.3	·· 00.7	67 53.7	·· 32.1
	16	229 34.3	91 27.7	30.2	133 09.9	31.3	136 07.4	00.7	82 55.8	32.0
	17	244 36.7	106 27.1	29.5	148 10.8	31.3	151 09.5	00.7	97 58.0	32.0
	18	259 39.2	121 26.5	N16 28.7	163 11.6	N23 31.2	166 11.6	N23 00.7	113 00.2	N14 31.9
	19	274 41.7	136 26.0	27.9	178 12.4	31.2	181 13.8	00.7	128 02.3	31.8
	20	289 44.1	151 25.4	27.1	193 13.3	31.2	196 15.9	00.7	143 04.5	31.7
	21	304 46.6	166 24.9	·· 26.4	208 14.1	·· 31.2	211 18.0	·· 00.7	158 06.7	·· 31.6
	22	319 49.0	181 24.3	25.6	223 15.0	31.2	226 20.1	00.7	173 08.8	31.5
	23	334 51.5	196 23.7	24.8	238 15.8	31.1	241 22.2	00.7	188 11.0	31.4
11	00	349 54.0	211 23.2	N16 24.0	253 16.6	N23 31.1	256 24.4	N23 00.7	203 13.2	N14 31.3
	01	4 56.4	226 22.6	23.3	268 17.5	31.1	271 26.5	00.7	218 15.4	31.2
	02	19 58.9	241 22.0	22.5	283 18.3	31.1	286 28.6	00.7	233 17.5	31.1
	03	35 01.4	256 21.5	·· 21.7	298 19.1	·· 31.1	301 30.7	·· 00.6	248 19.7	·· 31.0
	04	50 03.8	271 20.9	20.9	313 20.0	31.0	316 32.8	00.6	263 21.9	30.9
	05	65 06.3	286 20.3	20.1	328 20.8	31.0	331 35.0	00.6	278 24.0	30.8
	06	80 08.8	301 19.8	N16 19.4	343 21.7	N23 31.0	346 37.1	N23 00.6	293 26.2	N14 30.7
	07	95 11.2	316 19.2	18.6	358 22.5	31.0	1 39.2	00.6	308 28.4	30.6
	08	110 13.7	331 18.7	17.8	13 23.3	30.9	16 41.3	00.6	323 30.5	30.5
S	09	125 16.2	346 18.1	·· 17.0	28 24.2	·· 30.9	31 43.4	·· 00.6	338 32.7	·· 30.4
U	10	140 18.6	1 17.5	16.2	43 25.0	30.9	46 45.6	00.6	353 34.9	30.3
N	11	155 21.1	16 17.0	15.4	58 25.9	30.9	61 47.7	00.6	8 37.0	30.2
D	12	170 23.5	31 16.4	N16 14.7	73 26.7	N23 30.9	76 49.8	N23 00.6	23 39.2	N14 30.1
A	13	185 26.0	46 15.9	13.9	88 27.6	30.8	91 51.9	00.6	38 41.4	30.0
Y	14	200 28.5	61 15.3	13.1	103 28.4	30.8	106 54.0	00.6	53 43.5	29.9
	15	215 30.9	76 14.7	·· 12.3	118 29.2	·· 30.8	121 56.2	·· 00.6	68 45.7	·· 29.9
	16	230 33.4	91 14.2	11.5	133 30.1	30.8	136 58.3	00.6	83 47.9	29.8
	17	245 35.9	106 13.6	10.7	148 30.9	30.7	152 00.4	00.6	98 50.1	29.7
	18	260 38.3	121 13.1	N16 09.9	163 31.8	N23 30.7	167 02.5	N23 00.6	113 52.2	N14 29.6
	19	275 40.8	136 12.5	09.1	178 32.6	30.7	182 04.7	00.5	128 54.4	29.5
	20	290 43.3	151 11.9	08.3	193 33.5	30.7	197 06.8	00.5	143 56.6	29.4
	21	305 45.7	166 11.4	·· 07.5	208 34.3	·· 30.6	212 08.9	·· 00.5	158 58.7	·· 29.3
	22	320 48.2	181 10.8	06.7	223 35.1	30.6	227 11.0	00.5	174 00.9	29.2
	23	335 50.7	196 10.3	05.9	238 36.0	30.6	242 13.2	00.5	189 03.1	29.1
12	00	350 53.1	211 09.7	N16 05.1	253 36.8	N23 30.6	257 15.3	N23 00.5	204 05.2	N14 29.0
	01	5 55.6	226 09.2	04.3	268 37.7	30.5	272 17.4	00.5	219 07.4	28.9
	02	20 58.0	241 08.6	03.5	283 38.5	30.5	287 19.5	00.5	234 09.6	28.8
	03	36 00.5	256 08.0	·· 02.7	298 39.4	·· 30.5	302 21.7	·· 00.5	249 11.8	·· 28.7
	04	51 03.0	271 07.5	01.9	313 40.2	30.4	317 23.8	00.5	264 13.9	28.6
	05	66 05.4	286 06.9	01.1	328 41.1	30.4	332 25.9	00.5	279 16.1	28.5
	06	81 07.9	301 06.4	N16 00.3	343 41.9	N23 30.4	347 28.0	N23 00.5	294 18.3	N14 28.4
	07	96 10.4	316 05.8	15 59.5	358 42.8	30.4	2 30.2	00.5	309 20.4	28.3
	08	111 12.8	331 05.3	58.7	13 43.6	30.3	17 32.3	00.5	324 22.6	28.2
M	09	126 15.3	346 04.7	·· 57.9	28 44.5	·· 30.3	32 34.4	·· 00.5	339 24.8	·· 28.1
O	10	141 17.8	1 04.2	57.1	43 45.3	30.3	47 36.6	00.5	354 26.9	28.0
N	11	156 20.2	16 03.6	56.3	58 46.2	30.2	62 38.7	00.4	9 29.1	27.9
D	12	171 22.7	31 03.0	N15 55.5	73 47.0	N23 30.2	77 40.8	N23 00.4	24 31.3	N14 27.9
A	13	186 25.1	46 02.5	54.7	88 47.9	30.2	92 42.9	00.4	39 33.5	27.8
Y	14	201 27.6	61 01.9	53.9	103 48.7	30.2	107 45.1	00.4	54 35.6	27.7
	15	216 30.1	76 01.4	·· 53.1	118 49.6	·· 30.1	122 47.2	·· 00.4	69 37.8	·· 27.6
	16	231 32.5	91 00.8	52.3	133 50.4	30.1	137 49.3	00.4	84 40.0	27.5
	17	246 35.0	106 00.3	51.5	148 51.3	30.1	152 51.5	00.4	99 42.1	27.4
	18	261 37.5	120 59.7	N15 50.7	163 52.1	N23 30.0	167 53.6	N23 00.4	114 44.3	N14 27.3
	19	276 39.9	135 59.2	49.9	178 53.0	30.0	182 55.7	00.4	129 46.5	27.2
	20	291 42.4	150 58.6	49.0	193 53.8	30.0	197 57.9	00.4	144 48.7	27.1
	21	306 44.9	165 58.1	·· 48.2	208 54.7	·· 29.9	213 00.0	·· 00.4	159 50.8	·· 27.0
	22	321 47.3	180 57.5	47.4	223 55.5	29.9	228 02.1	00.4	174 53.0	26.9
	23	336 49.8	195 57.0	46.6	238 56.4	29.9	243 04.2	00.4	189 55.2	26.8
Mer. Pass.		h m 0 40.3	v −0.6	d 0.8	v 0.8	d 0.0	v 2.1	d 0.0	v 2.2	d 0.1

STARS		
Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 38.6	S40 23.4
Achernar	335 46.4	S57 20.8
Acrux	173 40.0	S62 58.6
Adhara	255 33.9	S28 56.3
Aldebaran	291 20.3	N16 27.9
Alioth	166 44.9	N56 05.0
Alkaid	153 20.5	N49 25.7
Al Na'ir	28 17.1	S47 04.1
Alnilam	276 13.7	S 1 12.9
Alphard	218 22.8	S 8 33.6
Alphecca	126 34.0	N26 47.7
Alpheratz	358 11.0	N28 58.2
Altair	62 34.3	N 8 48.8
Ankaa	353 41.9	S42 25.4
Antares	112 59.4	S26 22.9
Arcturus	146 20.6	N19 18.1
Atria	108 25.5	S68 59.5
Avior	234 29.4	S59 26.1
Bellatrix	279 00.9	N 6 19.8
Betelgeuse	271 30.5	N 7 24.2
Canopus	264 08.3	S52 40.8
Capella	281 14.3	N45 58.4
Deneb	49 49.5	N45 12.4
Denebola	183 01.4	N14 41.9
Diphda	349 22.6	S18 06.4
Dubhe	194 25.4	N61 52.3
Elnath	278 46.7	N28 35.2
Eltanin	90 58.6	N51 29.9
Enif	34 13.3	N 9 46.6
Fomalhaut	15 53.3	S29 44.3
Gacrux	172 31.5	S56 59.3
Gienah	176 20.4	S17 25.0
Hadar	149 26.6	S60 16.0
Hamal	328 30.9	N23 21.5
Kaus Aust.	84 19.4	S34 23.7
Kochab	137 19.7	N74 15.2
Markab	14 04.8	N15 05.3
Menkar	314 43.1	N 4 00.2
Menkent	148 39.6	S36 15.6
Miaplacidus	221 46.0	S69 37.4
Mirfak	309 18.7	N49 46.8
Nunki	76 31.5	S26 19.4
Peacock	54 01.2	S56 48.4
Pollux	244 00.9	N28 04.7
Procyon	245 28.1	N 5 17.0
Rasalhague	96 31.4	N12 34.8
Regulus	208 12.5	N12 04.6
Rigel	281 38.0	S 8 13.5
Rigil Kent.	140 28.9	S60 44.7
Sabik	102 43.5	S15 41.7
Schedar	350 10.7	N56 24.9
Shaula	96 58.5	S37 05.3
Sirius	258 57.6	S16 41.0
Spica	158 59.9	S11 02.6
Suhail	223 12.6	S43 20.4
Vega	80 57.1	N38 46.2
Zuben'ubi	137 35.5	S15 56.9

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	221 29.2	9 55
Mars	263 22.7	7 06
Jupiter	266 30.4	6 53
Saturn	213 19.2	10 26

	G.M.T.	SUN G.H.A.	SUN Dec.	MOON G.H.A.	v	Dec.	d	H.P.
	d h	° ′	° ′	° ′	′	° ′	′	′
	10 00	180 42.8	N 5 03.9	221 38.7	11.9	N14 00.2	6.6	55.7
	01	195 43.0	03.0	236 09.6	11.9	13 53.6	6.7	55.7
	02	210 43.2	02.0	250 40.5	11.8	13 46.9	6.8	55.7
	03	225 43.4	· · 01.1	265 11.3	11.9	13 40.1	6.9	55.7
	04	240 43.7	5 00.1	279 42.2	11.9	13 33.2	6.9	55.8
	05	255 43.9	4 59.2	294 13.1	11.9	13 26.3	7.0	55.8
	06	270 44.1	N 4 58.2	308 44.0	11.9	N13 19.3	7.1	55.8
	07	285 44.3	57.3	323 14.9	11.8	13 12.2	7.2	55.8
S	08	300 44.5	56.3	337 45.7	11.9	13 05.0	7.2	55.9
A	09	315 44.7	· · 55.4	352 16.6	11.9	12 57.8	7.3	55.9
T	10	330 45.0	54.4	6 47.5	11.9	12 50.5	7.3	55.9
U	11	345 45.2	53.5	21 18.4	11.8	12 43.2	7.5	55.9
R	12	0 45.4	N 4 52.5	35 49.2	11.9	N12 35.7	7.4	56.0
D	13	15 45.6	51.6	50 20.1	11.9	12 28.3	7.6	56.0
A	14	30 45.8	50.7	64 51.0	11.8	12 20.7	7.7	56.0
Y	15	45 46.0	· · 49.7	79 21.8	11.9	12 13.0	7.7	56.1
	16	60 46.3	48.8	93 52.7	11.9	12 05.3	7.7	56.1
	17	75 46.5	47.8	108 23.6	11.8	11 57.6	7.9	56.1
	18	90 46.7	N 4 46.9	122 54.4	11.9	N11 49.7	7.9	56.1
	19	105 46.9	45.9	137 25.3	11.8	11 41.8	7.9	56.2
	20	120 47.1	45.0	151 56.1	11.9	11 33.9	8.1	56.2
	21	135 47.3	· · 44.0	166 27.0	11.8	11 25.8	8.1	56.2
	22	150 47.6	43.1	180 57.8	11.9	11 17.7	8.1	56.2
	23	165 47.8	42.1	195 28.7	11.8	11 09.6	8.3	56.3
	11 00	180 48.0	N 4 41.2	209 59.5	11.9	N11 01.3	8.3	56.3
	01	195 48.2	40.2	224 30.4	11.8	10 53.0	8.3	56.3
	02	210 48.4	39.3	239 01.2	11.8	10 44.7	8.4	56.4
	03	225 48.7	· · 38.3	253 32.0	11.8	10 36.3	8.5	56.4
	04	240 48.9	37.4	268 02.8	11.9	10 27.8	8.5	56.4
	05	255 49.1	36.4	282 33.7	11.8	10 19.3	8.6	56.4
	06	270 49.3	N 4 35.5	297 04.5	11.8	N10 10.7	8.7	56.5
	07	285 49.5	34.5	311 35.3	11.8	10 02.0	8.7	56.5
	08	300 49.7	33.6	326 06.1	11.8	9 53.3	8.8	56.5
S	09	315 50.0	· · 32.6	340 36.9	11.8	9 44.5	8.8	56.5
U	10	330 50.2	31.7	355 07.7	11.8	9 35.7	8.9	56.6
N	11	345 50.4	30.7	9 38.5	11.8	9 26.8	9.0	56.6
D	12	0 50.6	N 4 29.8	24 09.3	11.8	N 9 17.8	9.0	56.6
A	13	15 50.8	28.8	38 40.1	11.7	9 08.8	9.0	56.7
Y	14	30 51.1	27.9	53 10.8	11.8	8 59.8	9.1	56.7
	15	45 51.3	· · 26.9	67 41.6	11.8	8 50.7	9.2	56.7
	16	60 51.5	25.9	82 12.4	11.7	8 41.5	9.2	56.7
	17	75 51.7	25.0	96 43.1	11.8	8 32.3	9.3	56.8
	18	90 51.9	N 4 24.0	111 13.9	11.7	N 8 23.0	9.3	56.8
	19	105 52.2	23.1	125 44.6	11.7	8 13.7	9.4	56.8
	20	120 52.4	22.1	140 15.3	11.8	8 04.3	9.4	56.9
	21	135 52.6	· · 21.2	154 46.1	11.7	7 54.9	9.5	56.9
	22	150 52.8	20.2	169 16.8	11.7	7 45.4	9.5	56.9
	23	165 53.0	19.3	183 47.5	11.7	7 35.9	9.6	56.9
	12 00	180 53.2	N 4 18.3	198 18.2	11.7	N 7 26.3	9.6	57.0
	01	195 53.5	17.4	212 48.9	11.6	7 16.7	9.6	57.0
	02	210 53.7	16.4	227 19.5	11.7	7 07.1	9.7	57.0
	03	225 53.9	· · 15.5	241 50.2	11.7	6 57.4	9.8	57.0
	04	240 54.1	14.5	256 20.9	11.6	6 47.6	9.8	57.1
	05	255 54.3	13.6	270 51.5	11.6	6 37.8	9.8	57.1
	06	270 54.6	N 4 12.6	285 22.1	11.7	N 6 28.0	9.9	57.1
	07	285 54.8	11.7	299 52.8	11.6	6 18.1	10.0	57.2
	08	300 55.0	10.7	314 23.4	11.6	6 08.1	9.9	57.2
M	09	315 55.2	· · 09.7	328 54.0	11.6	5 58.2	10.0	57.2
O	10	330 55.4	08.8	343 24.6	11.5	5 48.2	10.1	57.2
N	11	345 55.7	07.8	357 55.1	11.6	5 38.1	10.1	57.3
D	12	0 55.9	N 4 06.9	12 25.7	11.5	N 5 28.0	10.1	57.3
A	13	15 56.1	05.9	26 56.2	11.6	5 17.9	10.1	57.3
Y	14	30 56.3	05.0	41 26.8	11.5	5 07.8	10.2	57.4
	15	45 56.5	· · 04.0	55 57.3	11.5	4 57.6	10.3	57.4
	16	60 56.8	03.1	70 27.8	11.5	4 47.3	10.2	57.4
	17	75 57.0	02.1	84 58.3	11.5	4 37.1	10.3	57.4
	18	90 57.2	N 4 01.2	99 28.8	11.4	N 4 26.8	10.4	57.5
	19	105 57.4	4 00.2	113 59.2	11.5	4 16.4	10.3	57.5
	20	120 57.6	3 59.2	128 29.7	11.4	4 06.1	10.4	57.5
	21	135 57.9	· · 58.3	143 00.1	11.4	3 55.7	10.5	57.5
	22	150 58.1	57.3	157 30.5	11.4	3 45.2	10.4	57.6
	23	165 58.3	56.4	172 00.9	11.4	3 34.8	10.5	57.6
		S.D. 15.9	d 1.0	S.D. 15.3		15.4		15.6

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 10	Moonrise 11	Moonrise 12	Moonrise 13
°	h m	h m	h m	h m	h m	h m	h m
N 72	01 25	03 33	04 48	25 42	01 42	03 28	05 15
N 70	02 11	03 49	04 55	00 24	02 00	03 38	05 19
68	02 40	04 02	05 02	00 45	02 14	03 47	05 22
66	03 01	04 13	05 07	01 02	02 26	03 53	05 24
64	03 17	04 21	05 11	01 15	02 35	03 59	05 26
62	03 30	04 29	05 15	01 27	02 44	04 04	05 27
60	03 41	04 35	05 18	01 37	02 51	04 08	05 29
N 58	03 51	04 40	05 21	01 45	02 57	04 12	05 30
56	03 59	04 45	05 23	01 53	03 02	04 16	05 31
54	04 06	04 49	05 26	01 59	03 07	04 19	05 32
52	04 12	04 53	05 28	02 05	03 12	04 21	05 33
50	04 17	04 57	05 29	02 10	03 16	04 24	05 34
45	04 28	05 04	05 34	02 22	03 24	04 29	05 36
N 40	04 37	05 10	05 37	02 32	03 32	04 34	05 38
35	04 44	05 14	05 40	02 40	03 38	04 38	05 39
30	04 50	05 18	05 42	02 47	03 43	04 41	05 40
20	04 59	05 24	05 46	02 59	03 53	04 47	05 42
N 10	05 04	05 29	05 50	03 10	04 01	04 52	05 44
0	05 09	05 33	05 53	03 20	04 09	04 57	05 46
S 10	05 11	05 36	05 57	03 30	04 16	05 02	05 48
20	05 12	05 38	06 00	03 41	04 24	05 07	05 49
30	05 12	05 40	06 03	03 54	04 34	05 13	05 52
35	05 11	05 40	06 06	04 01	04 39	05 16	05 53
40	05 09	05 41	06 08	04 09	04 45	05 20	05 54
45	05 07	05 41	06 10	04 18	04 52	05 25	05 56
S 50	05 04	05 41	06 13	04 29	05 01	05 30	05 58
52	05 02	05 41	06 15	04 35	05 05	05 32	05 59
54	05 00	05 41	06 16	04 40	05 09	05 35	06 00
56	04 58	05 41	06 18	04 47	05 14	05 38	06 01
58	04 55	05 41	06 20	04 54	05 19	05 41	06 02
S 60	04 52	05 41	06 22	05 02	05 25	05 45	06 03

Lat.	Sunset	Twilight Civil	Twilight Naut.	Moonset 10	Moonset 11	Moonset 12	Moonset 13
°	h m	h m	h m	h m	h m	h m	h m
N 72	19 02	20 17	22 17	18 27	18 21	18 16	18 10
N 70	18 55	20 01	21 36	18 07	18 09	18 10	18 10
68	18 49	19 48	21 09	17 52	17 59	18 05	18 10
66	18 45	19 38	20 49	17 39	17 51	18 01	18 10
64	18 41	19 30	20 33	17 29	17 44	17 58	18 10
62	18 37	19 23	20 20	17 20	17 38	17 55	18 10
60	18 34	19 17	20 10	17 12	17 33	17 52	18 10
N 58	18 31	19 11	20 01	17 05	17 28	17 50	18 10
56	18 29	19 07	19 53	16 59	17 24	17 47	18 10
54	18 27	19 02	19 46	16 53	17 20	17 46	18 10
52	18 25	18 59	19 40	16 48	17 17	17 44	18 10
50	18 23	18 56	19 35	16 44	17 14	17 42	18 10
45	18 19	18 49	19 24	16 34	17 07	17 39	18 10
N 40	18 16	18 43	19 15	16 26	17 01	17 36	18 10
35	18 13	18 38	19 08	16 19	16 57	17 33	18 10
30	18 11	18 35	19 03	16 13	16 52	17 31	18 10
20	18 07	18 29	18 54	16 02	16 45	17 27	18 10
N 10	18 03	18 24	18 49	15 52	16 38	17 24	18 10
0	18 00	18 21	18 45	15 43	16 32	17 20	18 09
S 10	17 57	18 18	18 42	15 34	16 25	17 17	18 09
20	17 54	18 16	18 41	15 25	16 19	17 13	18 09
30	17 50	18 14	18 42	15 14	16 11	17 09	18 09
35	17 48	18 14	18 43	15 07	16 06	17 07	18 09
40	17 46	18 13	18 45	15 00	16 01	17 04	18 09
45	17 44	18 13	18 47	14 52	15 55	17 01	18 09
S 50	17 41	18 13	18 50	14 41	15 48	16 57	18 08
52	17 39	18 13	18 52	14 36	15 45	16 55	18 08
54	17 38	18 13	18 54	14 31	15 41	16 53	18 08
56	17 36	18 13	18 57	14 25	15 37	16 51	18 08
58	17 35	18 14	18 59	14 19	15 32	16 49	18 08
S 60	17 33	18 14	19 03	14 11	15 27	16 46	18 08

Day	SUN Eqn. of Time 00ʰ	SUN Eqn. of Time 12ʰ	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
	m s	m s	h m	h m	h m	d	
10	02 51	03 01	11 57	09 32	21 56	27	●
11	03 12	03 22	11 57	10 20	22 44	28	
12	03 33	03 43	11 56	11 09	23 33	29	

	G.M.T.	ARIES	VENUS −3.4		MARS +0.9		JUPITER −1.8		SATURN +0.8	
		G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
	d h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
	13 00	351 52.3	210 56.4	N15 45.8	253 57.2	N23 29.8	258 06.4	N23 00.4	204 57.3	N14 26.7
	01	6 54.7	225 55.9	45.0	268 58.1	29.8	273 08.5	00.4	219 59.5	26.6
	02	21 57.2	240 55.3	44.1	283 58.9	29.8	288 10.6	00.4	235 01.7	26.5
	03	36 59.6	255 54.8	·· 43.3	298 59.8	·· 29.8	303 12.8	·· 00.3	250 03.9	·· 26.4
	04	52 02.1	270 54.2	42.5	314 00.6	29.7	318 14.9	00.3	265 06.0	26.3
	05	67 04.6	285 53.7	41.7	329 01.5	29.7	333 17.0	00.3	280 08.2	26.2
	06	82 07.0	300 53.1	N15 40.9	344 02.3	N23 29.7	348 19.2	N23 00.3	295 10.4	N14 26.1
	07	97 09.5	315 52.6	40.0	359 03.2	29.6	3 21.3	00.3	310 12.5	26.0
T	08	112 12.0	330 52.0	39.2	14 04.0	29.6	18 23.4	00.3	325 14.7	26.0
U	09	127 14.4	345 51.5	·· 38.4	29 04.9	·· 29.5	33 25.6	·· 00.3	340 16.9	·· 25.9
E	10	142 16.9	0 50.9	37.6	44 05.8	29.5	48 27.7	00.3	355 19.1	25.8
S	11	157 19.4	15 50.4	36.8	59 06.6	29.5	63 29.8	00.3	10 21.2	25.7
D	12	172 21.8	30 49.9	N15 35.9	74 07.5	N23 29.4	78 32.0	N23 00.3	25 23.4	N14 25.6
A	13	187 24.3	45 49.3	35.1	89 08.3	29.4	93 34.1	00.3	40 25.6	25.5
Y	14	202 26.8	60 48.8	34.3	104 09.2	29.4	108 36.3	00.3	55 27.7	25.4
	15	217 29.2	75 48.2	·· 33.4	119 10.0	·· 29.3	123 38.4	·· 00.3	70 29.9	·· 25.3
	16	232 31.7	90 47.7	32.6	134 10.9	29.3	138 40.5	00.3	85 32.1	25.2
	17	247 34.1	105 47.1	31.8	149 11.8	29.3	153 42.7	00.3	100 34.3	25.1
	18	262 36.6	120 46.6	N15 31.0	164 12.6	N23 29.2	168 44.8	N23 00.3	115 36.4	N14 25.0
	19	277 39.1	135 46.0	30.1	179 13.5	29.2	183 46.9	00.2	130 38.6	24.9
	20	292 41.5	150 45.5	29.3	194 14.3	29.2	198 49.1	00.2	145 40.8	24.8
	21	307 44.0	165 44.9	·· 28.5	209 15.2	·· 29.1	213 51.2	·· 00.2	160 42.9	·· 24.7
	22	322 46.5	180 44.4	27.6	224 16.1	29.1	228 53.3	00.2	175 45.1	24.6
	23	337 48.9	195 43.9	26.8	239 16.9	29.0	243 55.5	00.2	190 47.3	24.5
	14 00	352 51.4	210 43.3	N15 26.0	254 17.8	N23 29.0	258 57.6	N23 00.2	205 49.5	N14 24.4
	01	7 53.9	225 42.8	25.1	269 18.6	29.0	273 59.8	00.2	220 51.6	24.3
	02	22 56.3	240 42.2	24.3	284 19.5	28.9	289 01.9	00.2	235 53.8	24.3
	03	37 58.8	255 41.7	·· 23.5	299 20.4	·· 28.9	304 04.0	·· 00.2	250 56.0	·· 24.2
	04	53 01.2	270 41.2	22.6	314 21.2	28.9	319 06.2	00.2	265 58.2	24.1
	05	68 03.7	285 40.6	21.8	329 22.1	28.8	334 08.3	00.2	281 00.3	24.0
	06	83 06.2	300 40.1	N15 20.9	344 22.9	N23 28.8	349 10.5	N23 00.2	296 02.5	N14 23.9
W	07	98 08.6	315 39.5	20.1	359 23.8	28.7	4 12.6	00.2	311 04.7	23.8
E	08	113 11.1	330 39.0	19.3	14 24.7	28.7	19 14.7	00.2	326 06.9	23.7
D	09	128 13.6	345 38.4	·· 18.4	29 25.5	·· 28.7	34 16.9	·· 00.2	341 09.0	·· 23.6
N	10	143 16.0	0 37.9	17.6	44 26.4	28.6	49 19.0	00.1	356 11.2	23.5
E	11	158 18.5	15 37.4	16.7	59 27.3	28.6	64 21.2	00.1	11 13.4	23.4
S	12	173 21.0	30 36.8	N15 15.9	74 28.1	N23 28.5	79 23.3	N23 00.1	26 15.5	N14 23.3
D	13	188 23.4	45 36.3	15.0	89 29.0	28.5	94 25.4	00.1	41 17.7	23.2
A	14	203 25.9	60 35.8	14.2	104 29.8	28.4	109 27.6	00.1	56 19.9	23.1
Y	15	218 28.4	75 35.2	·· 13.4	119 30.7	·· 28.4	124 29.7	·· 00.1	71 22.1	·· 23.0
	16	233 30.8	90 34.7	12.5	134 31.6	28.4	139 31.9	00.1	86 24.2	22.9
	17	248 33.3	105 34.1	11.7	149 32.4	28.3	154 34.0	00.1	101 26.4	22.8
	18	263 35.7	120 33.6	N15 10.8	164 33.3	N23 28.3	169 36.2	N23 00.1	116 28.6	N14 22.7
	19	278 38.2	135 33.1	10.0	179 34.2	28.2	184 38.3	00.1	131 30.8	22.6
	20	293 40.7	150 32.5	09.1	194 35.0	28.2	199 40.5	00.1	146 32.9	22.6
	21	308 43.1	165 32.0	·· 08.3	209 35.9	·· 28.2	214 42.6	·· 00.1	161 35.1	·· 22.5
	22	323 45.6	180 31.5	07.4	224 36.8	28.1	229 44.7	00.1	176 37.3	22.4
	23	338 48.1	195 30.9	06.6	239 37.6	28.1	244 46.9	00.1	191 39.5	22.3
	15 00	353 50.5	210 30.4	N15 05.7	254 38.5	N23 28.0	259 49.0	N23 00.1	206 41.6	N14 22.2
	01	8 53.0	225 29.8	04.9	269 39.4	28.0	274 51.2	00.1	221 43.8	22.1
	02	23 55.5	240 29.3	04.0	284 40.2	27.9	289 53.3	00.0	236 46.0	22.0
	03	38 57.9	255 28.8	·· 03.1	299 41.1	·· 27.9	304 55.5	·· 00.0	251 48.2	·· 21.9
	04	54 00.4	270 28.2	02.3	314 42.0	27.8	319 57.6	00.0	266 50.3	21.8
	05	69 02.9	285 27.7	01.4	329 42.9	27.8	334 59.8	00.0	281 52.5	21.7
	06	84 05.3	300 27.2	N15 00.6	344 43.7	N23 27.8	350 01.9	N23 00.0	296 54.7	N14 21.6
	07	99 07.8	315 26.6	14 59.7	359 44.6	27.7	5 04.1	00.0	311 56.9	21.5
T	08	114 10.2	330 26.1	58.9	14 45.5	27.7	20 06.2	00.0	326 59.0	21.4
H	09	129 12.7	345 25.6	·· 58.0	29 46.3	·· 27.6	35 08.3	·· 00.0	342 01.2	·· 21.3
U	10	144 15.2	0 25.0	57.1	44 47.2	27.6	50 10.5	00.0	357 03.4	21.2
R	11	159 17.6	15 24.5	56.3	59 48.1	27.5	65 12.6	00.0	12 05.6	21.1
S	12	174 20.1	30 24.0	N14 55.4	74 48.9	N23 27.5	80 14.8	N23 00.0	27 07.7	N14 21.1
D	13	189 22.6	45 23.4	54.5	89 49.8	27.4	95 16.9	00.0	42 09.9	21.0
A	14	204 25.0	60 22.9	53.7	104 50.7	27.4	110 19.1	00.0	57 12.1	20.9
Y	15	219 27.5	75 22.4	·· 52.8	119 51.6	·· 27.3	125 21.2	·· 00.0	72 14.3	·· 20.8
	16	234 30.0	90 21.9	52.0	134 52.4	27.3	140 23.4	23 00.0	87 16.4	20.7
	17	249 32.4	105 21.3	51.1	149 53.3	27.2	155 25.5	22 59.9	102 18.6	20.6
	18	264 34.9	120 20.8	N14 50.2	164 54.2	N23 27.2	170 27.7	N22 59.9	117 20.8	N14 20.5
	19	279 37.3	135 20.3	49.4	179 55.1	27.2	185 29.8	59.9	132 23.0	20.4
	20	294 39.8	150 19.7	48.5	194 55.9	27.1	200 32.0	59.9	147 25.1	20.3
	21	309 42.3	165 19.2	·· 47.6	209 56.8	·· 27.1	215 34.1	·· 59.9	162 27.3	·· 20.2
	22	324 44.7	180 18.7	46.8	224 57.7	27.0	230 36.3	59.9	177 29.5	20.1
	23	339 47.2	195 18.1	45.9	239 58.6	27.0	245 38.4	59.9	192 31.7	20.0
	Mer. Pass.	h m 0 28.5	v −0.5	d 0.8	v 0.9	d 0.0	v 2.1	d 0.0	v 2.2	d 0.1

STARS		
Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 38.6	S40 23.4
Achernar	335 46.4	S57 20.8
Acrux	173 40.0	S62 58.6
Adhara	255 33.8	S28 56.3
Aldebaran	291 20.2	N16 27.9
Alioth	166 44.9	N56 05.0
Alkaid	153 20.5	N49 25.7
Al Na'ir	28 17.1	S47 04.1
Alnilam	276 13.7	S 1 12.9
Alphard	218 22.8	S 8 33.6
Alphecca	126 34.0	N26 47.7
Alpheratz	358 11.0	N28 58.2
Altair	62 34.3	N 8 48.8
Ankaa	353 41.9	S42 25.4
Antares	112 59.4	S26 22.9
Arcturus	146 20.6	N19 18.1
Atria	108 25.5	S68 59.4
Avior	234 29.4	S59 26.1
Bellatrix	279 00.9	N 6 19.8
Betelgeuse	271 30.5	N 7 24.2
Canopus	264 08.2	S52 40.8
Capella	281 14.3	N45 58.4
Deneb	49 49.5	N45 12.4
Denebola	183 01.4	N14 41.9
Diphda	349 22.6	S18 06.4
Dubhe	194 25.4	N61 52.3
Elnath	278 46.7	N28 35.2
Eltanin	90 58.6	N51 29.9
Enif	34 13.3	N 9 46.6
Fomalhaut	15 53.3	S29 44.3
Gacrux	172 31.5	S56 59.3
Gienah	176 20.4	S17 25.0
Hadar	149 26.6	S60 16.0
Hamal	328 30.9	N23 21.5
Kaus Aust.	84 19.4	S34 23.7
Kochab	137 19.8	N74 15.1
Markab	14 04.8	N15 05.3
Menkar	314 43.1	N 4 00.2
Menkent	148 39.7	S36 15.6
Miaplacidus	221 46.0	S69 37.4
Mirfak	309 18.7	N49 46.8
Nunki	76 31.6	S26 19.4
Peacock	54 01.2	S56 48.5
Pollux	244 00.9	N28 04.7
Procyon	245 28.1	N 5 17.0
Rasalhague	96 31.5	N12 34.8
Regulus	208 12.5	N12 04.6
Rigel	281 37.9	S 8 13.5
Rigil Kent.	140 28.9	S60 44.7
Sabik	102 43.5	S15 41.7
Schedar	350 10.7	N56 24.9
Shaula	96 58.5	S37 05.3
Sirius	258 57.6	S16 41.0
Spica	158 59.9	S11 02.6
Suhail	223 12.6	S43 20.4
Vega	80 57.1	N38 46.2
Zuben'ubi	137 35.5	S15 56.9

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	217 51.9	9 57
Mars	261 26.4	7 02
Jupiter	266 06.2	6 43
Saturn	212 58.1	10 15

	G.M.T.	SUN G.H.A.	SUN Dec.	MOON G.H.A.	MOON v	MOON Dec.	MOON d	MOON H.P.
	d h	° ′	° ′	° ′	′	° ′	′	′
	13 00	180 58.5	N 3 55.4	186 31.3	11.3	N 3 24.3	10.5	57.6
	01	195 58.7	54.5	201 01.6	11.4	3 13.8	10.5	57.6
	02	210 59.0	53.5	215 32.0	11.3	3 03.3	10.6	57.7
	03	225 59.2	·· 52.6	230 02.3	11.3	2 52.7	10.6	57.7
	04	240 59.4	51.6	244 32.6	11.3	2 42.1	10.6	57.7
	05	255 59.6	50.6	259 02.9	11.2	2 31.5	10.6	57.7
	06	270 59.8	N 3 49.7	273 33.1	11.3	N 2 20.9	10.7	57.8
	07	286 00.1	48.7	288 03.4	11.2	2 10.2	10.7	57.8
TUESDAY	08	301 00.3	47.8	302 33.6	11.2	1 59.5	10.7	57.8
	09	316 00.5	·· 46.8	317 03.8	11.2	1 48.8	10.7	57.8
	10	331 00.7	45.9	331 34.0	11.1	1 38.1	10.7	57.9
	11	346 00.9	44.9	346 04.1	11.2	1 27.4	10.7	57.9
	12	1 01.2	N 3 43.9	0 34.3	11.1	N 1 16.7	10.8	57.9
	13	16 01.4	43.0	15 04.4	11.1	1 05.9	10.8	57.9
	14	31 01.6	42.0	29 34.5	11.0	0 55.1	10.8	58.0
	15	46 01.8	·· 41.1	44 04.5	11.1	0 44.3	10.8	58.0
	16	61 02.0	40.1	58 34.6	11.0	0 33.5	10.8	58.0
	17	76 02.3	39.2	73 04.6	11.0	0 22.7	10.8	58.0
	18	91 02.5	N 3 38.2	87 34.6	10.9	N 0 11.9	10.9	58.1
	19	106 02.7	37.2	102 04.5	11.0	N 0 01.0	10.8	58.1
	20	121 02.9	36.3	116 34.5	10.9	S 0 09.8	10.8	58.1
	21	136 03.1	·· 35.3	131 04.4	10.8	0 20.6	10.9	58.1
	22	151 03.4	34.4	145 34.2	10.9	0 31.5	10.9	58.2
	23	166 03.6	33.4	160 04.1	10.8	0 42.4	10.8	58.2
	14 00	181 03.8	N 3 32.4	174 33.9	10.8	S 0 53.2	10.9	58.2
	01	196 04.0	31.5	189 03.7	10.8	1 04.1	10.9	58.2
	02	211 04.2	30.5	203 33.5	10.7	1 15.0	10.9	58.3
	03	226 04.5	·· 29.6	218 03.2	10.8	1 25.9	10.8	58.3
	04	241 04.7	28.6	232 33.0	10.6	1 36.7	10.9	58.3
	05	256 04.9	27.6	247 02.6	10.7	1 47.6	10.9	58.3
	06	271 05.1	N 3 26.7	261 32.3	10.6	S 1 58.5	10.8	58.3
WEDNESDAY	07	286 05.3	25.7	276 01.9	10.6	2 09.3	10.9	58.4
	08	301 05.6	24.8	290 31.5	10.6	2 20.2	10.9	58.4
	09	316 05.8	·· 23.8	305 01.1	10.5	2 31.1	10.8	58.4
	10	331 06.0	22.8	319 30.6	10.5	2 41.9	10.9	58.4
	11	346 06.2	21.9	334 00.1	10.5	2 52.8	10.8	58.4
	12	1 06.5	N 3 20.9	348 29.6	10.4	S 3 03.6	10.8	58.5
	13	16 06.7	20.0	2 59.0	10.4	3 14.4	10.8	58.5
	14	31 06.9	19.0	17 28.4	10.3	3 25.2	10.8	58.5
	15	46 07.1	·· 18.0	31 57.7	10.4	3 36.0	10.8	58.5
	16	61 07.3	17.1	46 27.1	10.3	3 46.8	10.8	58.5
	17	76 07.6	16.1	60 56.4	10.2	3 57.6	10.8	58.6
	18	91 07.8	N 3 15.2	75 25.6	10.2	S 4 08.4	10.7	58.6
	19	106 08.0	14.2	89 54.8	10.2	4 19.1	10.7	58.6
	20	121 08.2	13.2	104 24.0	10.2	4 29.8	10.7	58.6
	21	136 08.4	·· 12.3	118 53.2	10.1	4 40.5	10.7	58.6
	22	151 08.7	11.3	133 22.3	10.1	4 51.2	10.7	58.7
	23	166 08.9	10.4	147 51.4	10.0	5 01.9	10.6	58.7
	15 00	181 09.1	N 3 09.4	162 20.4	10.0	S 5 12.5	10.7	58.7
	01	196 09.3	08.4	176 49.4	10.0	5 23.2	10.6	58.7
	02	211 09.5	07.5	191 18.4	9.9	5 33.8	10.5	58.7
	03	226 09.8	·· 06.5	205 47.3	9.9	5 44.3	10.6	58.8
	04	241 10.0	05.6	220 16.2	9.8	5 54.9	10.5	58.8
	05	256 10.2	04.6	234 45.0	9.9	6 05.4	10.5	58.8
	06	271 10.4	N 3 03.6	249 13.9	9.7	S 6 15.9	10.4	58.8
	07	286 10.7	02.7	263 42.6	9.7	6 26.3	10.4	58.8
THURSDAY	08	301 10.9	01.7	278 11.3	9.7	6 36.7	10.4	58.8
	09	316 11.1	3 00.7	292 40.0	9.7	6 47.1	10.4	58.9
	10	331 11.3	2 59.8	307 08.7	9.6	6 57.5	10.3	58.9
	11	346 11.5	58.8	321 37.3	9.6	7 07.8	10.3	58.9
	12	1 11.8	N 2 57.9	336 05.9	9.5	S 7 18.1	10.2	58.9
	13	16 12.0	56.9	350 34.4	9.5	7 28.3	10.2	58.9
	14	31 12.2	55.9	5 02.9	9.4	7 38.5	10.2	58.9
	15	46 12.4	·· 55.0	19 31.3	9.4	7 48.7	10.1	58.9
	16	61 12.6	54.0	33 59.7	9.4	7 58.8	10.1	59.0
	17	76 12.9	53.0	48 28.1	9.3	8 08.9	10.0	59.0
	18	91 13.1	N 2 52.1	62 56.4	9.2	S 8 18.9	10.0	59.0
	19	106 13.3	51.1	77 24.6	9.3	8 28.9	10.0	59.0
	20	121 13.5	50.2	91 52.9	9.2	8 38.9	9.9	59.0
	21	136 13.8	·· 49.2	106 21.1	9.1	8 48.8	9.8	59.0
	22	151 14.0	48.2	120 49.2	9.1	8 58.6	9.8	59.0
	23	166 14.2	47.3	135 17.3	9.0	9 08.4	9.8	59.1
		S.D. 15.9	*d* 1.0	S.D. 15.8		15.9		16.0

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 13	Moonrise 14	Moonrise 15	Moonrise 16
°	h m	h m	h m	h m	h m	h m	h m
N 72	01 57	03 49	05 02	05 15	07 05	08 57	10 54
N 70	02 32	04 03	05 08	05 19	07 01	08 47	10 34
68	02 56	04 14	05 12	05 22	06 59	08 38	10 19
66	03 14	04 23	05 16	05 24	06 56	08 31	10 07
64	03 28	04 31	05 20	05 26	06 55	08 25	09 57
62	03 40	04 37	05 22	05 27	06 53	08 20	09 48
60	03 50	04 42	05 25	05 29	06 51	08 16	09 40
N 58	03 58	04 47	05 27	05 30	06 50	08 12	09 34
56	04 05	04 51	05 29	05 31	06 49	08 08	09 28
54	04 12	04 55	05 31	05 32	06 48	08 05	09 23
52	04 17	04 58	05 33	05 33	06 47	08 02	09 18
50	04 22	05 01	05 34	05 34	06 46	08 00	09 14
45	04 32	05 08	05 37	05 36	06 45	07 54	09 05
N 40	04 40	05 12	05 40	05 38	06 43	07 50	08 58
35	04 47	05 16	05 42	05 39	06 42	07 46	08 51
30	04 52	05 20	05 44	05 40	06 41	07 43	08 45
20	04 59	05 25	05 47	05 42	06 39	07 37	08 36
N 10	05 04	05 29	05 50	05 44	06 37	07 31	08 27
0	05 08	05 32	05 52	05 46	06 36	07 27	08 19
S 10	05 09	05 34	05 55	05 48	06 34	07 22	08 12
20	05 10	05 35	05 57	05 49	06 33	07 17	08 03
30	05 08	05 36	06 00	05 52	06 31	07 11	07 54
35	05 07	05 36	06 01	05 53	06 30	07 08	07 49
40	05 05	05 36	06 03	05 54	06 29	07 04	07 42
45	05 02	05 36	06 05	05 56	06 27	07 00	07 35
S 50	04 57	05 35	06 07	05 58	06 26	06 55	07 27
52	04 55	05 34	06 08	05 59	06 25	06 53	07 23
54	04 53	05 34	06 09	06 00	06 24	06 50	07 19
56	04 50	05 33	06 10	06 01	06 24	06 47	07 14
58	04 47	05 32	06 11	06 02	06 23	06 44	07 09
S 60	04 43	05 32	06 13	06 03	06 22	06 41	07 03

Lat.	Sunset	Twilight Civil	Twilight Naut.	Moonset 13	Moonset 14	Moonset 15	Moonset 16
°	h m	h m	h m	h m	h m	h m	h m
N 72	18 47	19 59	21 46	18 10	18 05	17 59	17 53
N 70	18 41	19 45	21 14	18 10	18 11	18 12	18 14
68	18 37	19 35	20 51	18 10	18 16	18 22	18 30
66	18 33	19 26	20 34	18 10	18 20	18 30	18 44
64	18 30	19 19	20 20	18 10	18 23	18 37	18 55
62	18 27	19 12	20 09	18 10	18 26	18 44	19 05
60	18 25	19 07	19 59	18 10	18 29	18 49	19 13
N 58	18 23	19 02	19 51	18 10	18 31	18 54	19 20
56	18 21	18 58	19 44	18 10	18 33	18 58	19 27
54	18 19	18 55	19 38	18 10	18 35	19 02	19 32
52	18 18	18 52	19 32	18 10	18 37	19 05	19 38
50	18 16	18 49	19 28	18 10	18 38	19 09	19 42
45	18 13	18 43	19 18	18 10	18 42	19 16	19 53
N 40	18 11	18 38	19 10	18 10	18 45	19 21	20 01
35	18 09	18 34	19 04	18 10	18 47	19 26	20 08
30	18 07	18 31	18 59	18 10	18 49	19 31	20 15
20	18 04	18 26	18 52	18 10	18 53	19 38	20 26
N 10	18 01	18 22	18 47	18 10	18 57	19 45	20 36
0	17 59	18 20	18 44	18 09	19 00	19 52	20 45
S 10	17 57	18 18	18 42	18 09	19 03	19 58	20 55
20	17 54	18 16	18 42	18 09	19 06	20 05	21 04
30	17 52	18 16	18 43	18 09	19 10	20 12	21 16
35	17 50	18 16	18 45	18 09	19 12	20 17	21 22
40	17 49	18 16	18 47	18 09	19 15	20 22	21 30
45	17 47	18 16	18 51	18 09	19 18	20 28	21 38
S 50	17 45	18 17	18 55	18 08	19 21	20 35	21 49
52	17 44	18 18	18 57	18 08	19 23	20 38	21 54
54	17 43	18 18	19 00	18 08	19 24	20 42	21 59
56	17 42	18 19	19 03	18 08	19 26	20 46	22 05
58	17 41	18 20	19 06	18 08	19 29	20 50	22 12
S 60	17 40	18 21	19 10	18 08	19 31	20 55	22 20

Day	SUN Eqn. of Time 00ʰ	SUN Eqn. of Time 12ʰ	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
	m s	m s	h m	h m	h m	d	
13	03 54	04 04	11 56	11 58	24 22	00	●
14	04 15	04 25	11 56	12 48	00 22	01	
15	04 36	04 47	11 55	13 39	01 13	02	

G.M.T.	ARIES G.H.A.	VENUS −3.4 G.H.A.	VENUS Dec.	MARS +0.9 G.H.A.	MARS Dec.	JUPITER −1.8 G.H.A.	JUPITER Dec.	SATURN +0.8 G.H.A.	SATURN Dec.
d h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
16 00	354 49.7	210 17.6	N14 45.0	254 59.4	N23 26.9	260 40.6	N22 59.9	207 33.8	N14 19.9
01	9 52.1	225 17.1	44.1	270 00.3	26.9	275 42.7	59.9	222 36.0	19.8
02	24 54.6	240 16.6	43.3	285 01.2	26.8	290 44.9	59.9	237 38.2	19.7
03	39 57.1	255 16.0	·· 42.4	300 02.1	·· 26.8	305 47.1	·· 59.9	252 40.4	·· 19.6
04	54 59.5	270 15.5	41.5	315 02.9	26.7	320 49.2	59.9	267 42.5	19.6
05	70 02.0	285 15.0	40.6	330 03.8	26.7	335 51.4	59.9	282 44.7	19.5
06	85 04.5	300 14.5	N14 39.8	345 04.7	N23 26.6	350 53.5	N22 59.9	297 46.9	N14 19.4
07	100 06.9	315 13.9	38.9	0 05.6	26.6	5 55.7	59.9	312 49.1	19.3
08	115 09.4	330 13.4	38.0	15 06.4	26.5	20 57.8	59.8	327 51.2	19.2
F 09	130 11.8	345 12.9	·· 37.1	30 07.3	·· 26.5	36 00.0	·· 59.8	342 53.4	·· 19.1
R 10	145 14.3	0 12.4	36.3	45 08.2	26.4	51 02.1	59.8	357 55.6	19.0
I 11	160 16.8	15 11.8	35.4	60 09.1	26.4	66 04.3	59.8	12 57.8	18.9
D 12	175 19.2	30 11.3	N14 34.5	75 10.0	N23 26.3	81 06.4	N22 59.8	27 59.9	N14 18.8
A 13	190 21.7	45 10.8	33.6	90 10.8	26.2	96 08.6	59.8	43 02.1	18.7
Y 14	205 24.2	60 10.3	32.7	105 11.7	26.2	111 10.7	59.8	58 04.3	18.6
15	220 26.6	75 09.7	·· 31.9	120 12.6	·· 26.1	126 12.9	·· 59.8	73 06.5	·· 18.5
16	235 29.1	90 09.2	31.0	135 13.5	26.1	141 15.1	59.8	88 08.7	18.4
17	250 31.6	105 08.7	30.1	150 14.4	26.0	156 17.2	59.8	103 10.8	18.3
18	265 34.0	120 08.2	N14 29.2	165 15.2	N23 26.0	171 19.4	N22 59.8	118 13.0	N14 18.2
19	280 36.5	135 07.6	28.3	180 16.1	25.9	186 21.5	59.8	133 15.2	18.2
20	295 39.0	150 07.1	27.4	195 17.0	25.9	201 23.7	59.8	148 17.4	18.1
21	310 41.4	165 06.6	·· 26.6	210 17.9	·· 25.8	216 25.8	·· 59.8	163 19.5	·· 18.0
22	325 43.9	180 06.1	25.7	225 18.8	25.8	231 28.0	59.8	178 21.7	17.9
23	340 46.3	195 05.5	24.8	240 19.7	25.7	246 30.2	59.7	193 23.9	17.8
17 00	355 48.8	210 05.0	N14 23.9	255 20.5	N23 25.7	261 32.3	N22 59.7	208 26.1	N14 17.7
01	10 51.3	225 04.5	23.0	270 21.4	25.6	276 34.5	59.7	223 28.2	17.6
02	25 53.7	240 04.0	22.1	285 22.3	25.5	291 36.6	59.7	238 30.4	17.5
03	40 56.2	255 03.5	·· 21.2	300 23.2	·· 25.5	306 38.8	·· 59.7	253 32.6	·· 17.4
04	55 58.7	270 02.9	20.3	315 24.1	25.4	321 41.0	59.7	268 34.8	17.3
05	71 01.1	285 02.4	19.4	330 25.0	25.4	336 43.1	59.7	283 37.0	17.2
06	86 03.6	300 01.9	N14 18.6	345 25.8	N23 25.3	351 45.3	N22 59.7	298 39.1	N14 17.1
07	101 06.1	315 01.4	17.7	0 26.7	25.3	6 47.4	59.7	313 41.3	17.0
S 08	116 08.5	330 00.9	16.8	15 27.6	25.2	21 49.6	59.7	328 43.5	16.9
A 09	131 11.0	345 00.4	·· 15.9	30 28.5	·· 25.2	36 51.8	·· 59.7	343 45.7	·· 16.8
T 10	146 13.4	359 59.8	15.0	45 29.4	25.1	51 53.9	59.7	358 47.8	16.8
U 11	161 15.9	14 59.3	14.1	60 30.3	25.0	66 56.1	59.7	13 50.0	16.7
R 12	176 18.4	29 58.8	N14 13.2	75 31.2	N23 25.0	81 58.2	N22 59.7	28 52.2	N14 16.6
D 13	191 20.8	44 58.3	12.3	90 32.1	24.9	97 00.4	59.7	43 54.4	16.5
A 14	206 23.3	59 57.8	11.4	105 32.9	24.9	112 02.6	59.6	58 56.6	16.4
Y 15	221 25.8	74 57.2	·· 10.5	120 33.8	·· 24.8	127 04.7	·· 59.6	73 58.7	·· 16.3
16	236 28.2	89 56.7	09.6	135 34.7	24.8	142 06.9	59.6	89 00.9	16.2
17	251 30.7	104 56.2	08.7	150 35.6	24.7	157 09.1	59.6	104 03.1	16.1
18	266 33.2	119 55.7	N14 07.8	165 36.5	N23 24.6	172 11.2	N22 59.6	119 05.3	N14 16.0
19	281 35.6	134 55.2	06.9	180 37.4	24.6	187 13.4	59.6	134 07.4	15.9
20	296 38.1	149 54.7	06.0	195 38.3	24.5	202 15.6	59.6	149 09.6	15.8
21	311 40.6	164 54.2	·· 05.1	210 39.2	·· 24.5	217 17.7	·· 59.6	164 11.8	·· 15.7
22	326 43.0	179 53.6	04.2	225 40.1	24.4	232 19.9	59.6	179 14.0	15.6
23	341 45.5	194 53.1	03.3	240 41.0	24.3	247 22.0	59.6	194 16.2	15.5
18 00	356 47.9	209 52.6	N14 02.4	255 41.8	N23 24.3	262 24.2	N22 59.6	209 18.3	N14 15.5
01	11 50.4	224 52.1	01.5	270 42.7	24.2	277 26.4	59.6	224 20.5	15.4
02	26 52.9	239 51.6	14 00.6	285 43.6	24.2	292 28.5	59.6	239 22.7	15.3
03	41 55.3	254 51.1	13 59.6	300 44.5	·· 24.1	307 30.7	·· 59.6	254 24.9	·· 15.2
04	56 57.8	269 50.6	58.7	315 45.4	24.0	322 32.9	59.5	269 27.1	15.1
05	72 00.3	284 50.0	57.8	330 46.3	24.0	337 35.0	59.5	284 29.2	15.0
06	87 02.7	299 49.5	N13 56.9	345 47.2	N23 23.9	352 37.2	N22 59.5	299 31.4	N14 14.9
07	102 05.2	314 49.0	56.0	0 48.1	23.9	7 39.4	59.5	314 33.6	14.8
08	117 07.7	329 48.5	55.1	15 49.0	23.8	22 41.5	59.5	329 35.8	14.7
S 09	132 10.1	344 48.0	·· 54.2	30 49.9	·· 23.7	37 43.7	·· 59.5	344 38.0	·· 14.6
U 10	147 12.6	359 47.5	53.3	45 50.8	23.7	52 45.9	59.5	359 40.1	14.5
N 11	162 15.1	14 47.0	52.4	60 51.7	23.6	67 48.0	59.5	14 42.3	14.4
D 12	177 17.5	29 46.5	N13 51.4	75 52.6	N23 23.5	82 50.2	N22 59.5	29 44.5	N14 14.3
A 13	192 20.0	44 46.0	50.5	90 53.5	23.5	97 52.4	59.5	44 46.7	14.3
Y 14	207 22.4	59 45.4	49.6	105 54.4	23.4	112 54.6	59.5	59 48.9	14.2
15	222 24.9	74 44.9	·· 48.7	120 55.3	·· 23.4	127 56.7	·· 59.5	74 51.0	·· 14.1
16	237 27.4	89 44.4	47.8	135 56.2	23.3	142 58.9	59.5	89 53.2	14.0
17	252 29.8	104 43.9	46.9	150 57.0	23.2	158 01.1	59.5	104 55.4	13.9
18	267 32.3	119 43.4	N13 46.0	165 57.9	N23 23.2	173 03.2	N22 59.5	119 57.6	N14 13.8
19	282 34.8	134 42.9	45.0	180 58.8	23.1	188 05.4	59.4	134 59.8	13.7
20	297 37.2	149 42.4	44.1	195 59.7	23.0	203 07.6	59.4	150 01.9	13.6
21	312 39.7	164 41.9	·· 43.2	211 00.6	·· 23.0	218 09.8	·· 59.4	165 04.1	·· 13.5
22	327 42.2	179 41.4	42.3	226 01.5	22.9	233 11.9	59.4	180 06.3	13.4
23	342 44.6	194 40.9	41.4	241 02.4	22.8	248 14.1	59.4	195 08.5	13.3
Mer. Pass.	h m 0 16.7	*v* −0.5	*d* 0.9	*v* 0.9	*d* 0.1	*v* 2.2	*d* 0.0	*v* 2.2	*d* 0.1

STARS Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 38.5	S40 23.4
Achernar	335 46.3	S57 20.8
Acrux	173 40.0	S62 58.6
Adhara	255 33.8	S28 56.3
Aldebaran	291 20.2	N16 27.9
Alioth	166 44.9	N56 05.0
Alkaid	153 20.6	N49 25.7
Al Na'ir	28 17.1	S47 04.1
Alnilam	276 13.7	S 1 12.9
Alphard	218 22.8	S 8 33.6
Alphecca	126 34.0	N26 47.7
Alpheratz	358 11.0	N28 58.2
Altair	62 34.3	N 8 48.8
Ankaa	353 41.9	S42 25.5
Antares	112 59.4	S26 22.9
Arcturus	146 20.6	N19 18.1
Atria	108 25.5	S68 59.4
Avior	234 29.4	S59 26.1
Bellatrix	279 00.9	N 6 19.8
Betelgeuse	271 30.5	N 7 24.2
Canopus	264 08.2	S52 40.8
Capella	281 14.2	N45 58.4
Deneb	49 49.5	N45 12.4
Denebola	183 01.4	N14 41.9
Diphda	349 22.6	S18 06.4
Dubhe	194 25.4	N61 52.2
Elnath	278 46.7	N28 35.2
Eltanin	90 58.6	N51 29.9
Enif	34 13.3	N 9 46.6
Fomalhaut	15 53.3	S29 44.3
Gacrux	172 31.5	S56 59.3
Gienah	176 20.4	S17 25.0
Hadar	149 26.6	S60 16.0
Hamal	328 30.9	N23 21.5
Kaus Aust.	84 19.5	S34 23.7
Kochab	137 19.8	N74 15.1
Markab	14 04.8	N15 05.3
Menkar	314 43.0	N 4 00.2
Menkent	148 39.7	S36 15.6
Miaplacidus	221 46.0	S69 37.4
Mirfak	309 18.7	N49 46.8
Nunki	76 31.6	S26 19.4
Peacock	54 01.2	S56 48.5
Pollux	244 00.8	N28 04.7
Procyon	245 28.1	N 5 17.0
Rasalhague	96 31.5	N12 34.9
Regulus	208 12.5	N12 04.6
Rigel	281 37.9	S 8 13.5
Rigil Kent.	140 28.9	S60 44.6
Sabik	102 43.5	S15 41.7
Schedar	350 10.7	N56 24.9
Shaula	96 58.5	S37 05.3
Sirius	258 57.6	S16 41.0
Spica	158 59.9	S11 02.6
Suhail	223 12.6	S43 20.4
Vega	80 57.1	N38 46.2
Zuben'ubi	137 35.5	S15 56.9

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	214 16.2	10 00
Mars	259 31.7	6 58
Jupiter	265 43.5	6 33
Saturn	212 37.3	10 05

	G.M.T.	SUN G.H.A.	SUN Dec.	MOON G.H.A.	MOON v	MOON Dec.	MOON d	MOON H.P.
	d h	° ′	° ′	° ′	′	° ′	′	′
	16 00	181 14.4	N 2 46.3	149 45.3	9.1	S 9 18.2	9.7	59.1
	01	196 14.6	45.3	164 13.4	8.9	9 27.9	9.6	59.1
	02	211 14.9	44.4	178 41.3	8.9	9 37.5	9.6	59.1
	03	226 15.1	·· 43.4	193 09.2	8.9	9 47.1	9.6	59.1
	04	241 15.3	42.4	207 37.1	8.8	9 56.7	9.4	59.1
	05	256 15.5	41.5	222 04.9	8.8	10 06.1	9.5	59.1
	06	271 15.7	N 2 40.5	236 32.7	8.8	S10 15.6	9.3	59.1
	07	286 16.0	39.5	251 00.5	8.7	10 24.9	9.3	59.1
	08	301 16.2	38.6	265 28.2	8.6	10 34.2	9.3	59.2
F	09	316 16.4	·· 37.6	279 55.8	8.6	10 43.5	9.2	59.2
R	10	331 16.6	36.7	294 23.4	8.6	10 52.7	9.1	59.2
I	11	346 16.9	35.7	308 51.0	8.5	11 01.8	9.0	59.2
D	12	1 17.1	N 2 34.7	323 18.5	8.5	S11 10.8	9.0	59.2
A	13	16 17.3	33.8	337 46.0	8.4	11 19.8	8.9	59.2
Y	14	31 17.5	32.8	352 13.4	8.4	11 28.7	8.9	59.2
	15	46 17.7	·· 31.8	6 40.8	8.3	11 37.6	8.8	59.2
	16	61 18.0	30.9	21 08.1	8.3	11 46.4	8.7	59.2
	17	76 18.2	29.9	35 35.4	8.2	11 55.1	8.6	59.2
	18	91 18.4	N 2 28.9	50 02.6	8.2	S12 03.7	8.6	59.2
	19	106 18.6	28.0	64 29.8	8.2	12 12.3	8.5	59.3
	20	121 18.9	27.0	78 57.0	8.1	12 20.8	8.4	59.3
	21	136 19.1	·· 26.0	93 24.1	8.1	12 29.2	8.4	59.3
	22	151 19.3	25.1	107 51.2	8.0	12 37.6	8.3	59.3
	23	166 19.5	24.1	122 18.2	8.0	12 45.9	8.2	59.3
	17 00	181 19.7	N 2 23.1	136 45.2	7.9	S12 54.1	8.1	59.3
	01	196 20.0	22.2	151 12.1	7.9	13 02.2	8.0	59.3
	02	211 20.2	21.2	165 39.0	7.8	13 10.2	8.0	59.3
	03	226 20.4	·· 20.2	180 05.8	7.8	13 18.2	7.9	59.3
	04	241 20.6	19.3	194 32.6	7.8	13 26.1	7.7	59.3
	05	256 20.8	18.3	208 59.4	7.7	13 33.8	7.8	59.3
	06	271 21.1	N 2 17.3	223 26.1	7.7	S13 41.6	7.6	59.3
	07	286 21.3	16.4	237 52.8	7.6	13 49.2	7.5	59.3
S	08	301 21.5	15.4	252 19.4	7.6	13 56.7	7.5	59.3
A	09	316 21.7	·· 14.4	266 46.0	7.6	14 04.2	7.3	59.3
T	10	331 22.0	13.5	281 12.6	7.5	14 11.5	7.3	59.4
U	11	346 22.2	12.5	295 39.1	7.4	14 18.8	7.2	59.4
R	12	1 22.4	N 2 11.5	310 05.5	7.4	S14 26.0	7.1	59.4
D	13	16 22.6	10.6	324 31.9	7.4	14 33.1	7.0	59.4
A	14	31 22.8	09.6	338 58.3	7.4	14 40.1	6.9	59.4
Y	15	46 23.1	·· 08.6	353 24.7	7.2	14 47.0	6.8	59.4
	16	61 23.3	07.7	7 50.9	7.3	14 53.8	6.7	59.4
	17	76 23.5	06.7	22 17.2	7.2	15 00.5	6.7	59.4
	18	91 23.7	N 2 05.7	36 43.4	7.2	S15 07.2	6.5	59.4
	19	106 24.0	04.8	51 09.6	7.2	15 13.7	6.4	59.4
	20	121 24.2	03.8	65 35.8	7.1	15 20.1	6.4	59.4
	21	136 24.4	·· 02.8	80 01.9	7.0	15 26.5	6.2	59.4
	22	151 24.6	01.9	94 27.9	7.1	15 32.7	6.1	59.4
	23	166 24.8	2 00.9	108 54.0	6.9	15 38.8	6.1	59.4
	18 00	181 25.1	N 1 59.9	123 19.9	7.0	S15 44.9	5.9	59.4
	01	196 25.3	59.0	137 45.9	6.9	15 50.8	5.8	59.4
	02	211 25.5	58.0	152 11.8	6.9	15 56.6	5.8	59.4
	03	226 25.7	·· 57.0	166 37.7	6.9	16 02.4	5.6	59.4
	04	241 25.9	56.1	181 03.6	6.8	16 08.0	5.5	59.4
	05	256 26.2	55.1	195 29.4	6.8	16 13.5	5.4	59.4
	06	271 26.4	N 1 54.1	209 55.2	6.7	S16 18.9	5.3	59.4
	07	286 26.6	53.2	224 20.9	6.8	16 24.2	5.2	59.4
	08	301 26.8	52.2	238 46.7	6.7	16 29.4	5.1	59.4
S	09	316 27.1	·· 51.2	253 12.4	6.6	16 34.5	5.0	59.4
U	10	331 27.3	50.3	267 38.0	6.7	16 39.5	4.9	59.4
N	11	346 27.5	49.3	282 03.7	6.6	16 44.4	4.8	59.4
D	12	1 27.7	N 1 48.3	296 29.3	6.5	S16 49.2	4.6	59.4
A	13	16 27.9	47.4	310 54.8	6.6	16 53.8	4.6	59.4
Y	14	31 28.2	46.4	325 20.4	6.5	16 58.4	4.4	59.4
	15	46 28.4	·· 45.4	339 45.9	6.5	17 02.8	4.4	59.4
	16	61 28.6	44.4	354 11.4	6.5	17 07.2	4.2	59.4
	17	76 28.8	43.5	8 36.9	6.4	17 11.4	4.1	59.4
	18	91 29.1	N 1 42.5	23 02.3	6.5	S17 15.5	4.0	59.4
	19	106 29.3	41.5	37 27.8	6.4	17 19.5	3.8	59.4
	20	121 29.5	40.6	51 53.2	6.3	17 23.3	3.8	59.4
	21	136 29.7	·· 39.6	66 18.5	6.4	17 27.1	3.6	59.4
	22	151 29.9	38.6	80 43.9	6.3	17 30.7	3.6	59.4
	23	166 30.2	37.7	95 09.2	6.4	17 34.3	3.4	59.4
		S.D. 15.9	d 1.0	S.D.	16.1	16.2		16.2

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 16	Moonrise 17	Moonrise 18	Moonrise 19
°	h m	h m	h m	h m	h m	h m	h m
N 72	02 22	04 04	05 15	10 54	12 57	15 11	▬
N 70	02 50	04 16	05 19	10 34	12 24	14 11	15 43
68	03 11	04 25	05 23	10 19	12 00	13 36	14 58
66	03 26	04 33	05 26	10 07	11 42	13 11	14 29
64	03 39	04 40	05 28	09 57	11 27	12 52	14 06
62	03 49	04 45	05 30	09 48	11 14	12 36	13 48
60	03 58	04 50	05 32	09 40	11 04	12 23	13 34
N 58	04 06	04 54	05 34	09 34	10 55	12 12	13 21
56	04 12	04 57	05 35	09 28	10 47	12 02	13 10
54	04 18	05 01	05 36	09 23	10 40	11 53	13 01
52	04 23	05 03	05 37	09 18	10 33	11 46	12 52
50	04 27	05 06	05 38	09 14	10 28	11 39	12 44
45	04 36	05 11	05 41	09 05	10 15	11 24	12 28
N 40	04 43	05 15	05 43	08 58	10 05	11 12	12 15
35	04 49	05 19	05 44	08 51	09 57	11 01	12 04
30	04 54	05 21	05 45	08 45	09 49	10 52	11 54
20	05 00	05 26	05 48	08 36	09 36	10 37	11 37
N 10	05 04	05 29	05 50	08 27	09 25	10 23	11 22
0	05 07	05 31	05 51	08 19	09 14	10 11	11 08
S 10	05 07	05 32	05 53	08 12	09 04	09 58	10 54
20	05 07	05 32	05 54	08 03	08 52	09 45	10 40
30	05 04	05 32	05 56	07 54	08 40	09 29	10 23
35	05 02	05 32	05 57	07 49	08 32	09 21	10 13
40	05 00	05 31	05 58	07 42	08 24	09 11	10 02
45	04 56	05 30	05 59	07 35	08 15	08 59	09 49
S 50	04 51	05 28	06 00	07 27	08 03	08 45	09 33
52	04 48	05 27	06 01	07 23	07 58	08 38	09 26
54	04 45	05 26	06 02	07 19	07 52	08 31	09 18
56	04 42	05 25	06 02	07 14	07 45	08 23	09 09
58	04 38	05 24	06 03	07 09	07 38	08 14	08 58
S 60	04 34	05 22	06 04	07 03	07 30	08 03	08 46

Lat.	Sunset	Twilight Civil	Twilight Naut.	Moonset 16	Moonset 17	Moonset 18	Moonset 19
°	h m	h m	h m	h m	h m	h m	h m
N 72	18 31	19 41	21 21	17 53	17 44	17 29	▬
N 70	18 27	19 30	20 54	18 14	18 19	18 30	18 59
68	18 24	19 21	20 35	18 30	18 43	19 05	19 44
66	18 21	19 14	20 20	18 44	19 03	19 31	20 14
64	18 19	19 07	20 07	18 55	19 18	19 50	20 36
62	18 17	19 02	19 57	19 05	19 31	20 07	20 54
60	18 16	18 58	19 49	19 13	19 42	20 20	21 09
N 58	18 14	18 54	19 41	19 20	19 52	20 32	21 21
56	18 13	18 50	19 35	19 27	20 00	20 42	21 32
54	18 12	18 47	19 30	19 32	20 08	20 51	21 42
52	18 11	18 44	19 25	19 38	20 15	20 59	21 51
50	18 10	18 42	19 20	19 42	20 21	21 06	21 58
45	18 08	18 37	19 12	19 53	20 34	21 21	22 15
N 40	18 06	18 33	19 05	20 01	20 45	21 34	22 28
35	18 04	18 30	18 59	20 08	20 54	21 45	22 40
30	18 03	18 27	18 55	20 15	21 03	21 54	22 50
20	18 01	18 23	18 49	20 26	21 17	22 10	23 07
N 10	17 59	18 20	18 45	20 36	21 29	22 25	23 22
0	17 58	18 18	18 42	20 45	21 41	22 38	23 36
S 10	17 56	18 17	18 42	20 55	21 52	22 51	23 50
20	17 55	18 17	18 42	21 04	22 05	23 05	24 05
30	17 53	18 17	18 45	21 16	22 19	23 22	24 22
35	17 53	18 18	18 47	21 22	22 27	23 31	24 32
40	17 52	18 19	18 50	21 30	22 37	23 42	24 43
45	17 51	18 20	18 54	21 38	22 48	23 55	24 56
S 50	17 50	18 22	19 00	21 49	23 01	24 10	00 10
52	17 49	18 23	19 02	21 54	23 08	24 17	00 17
54	17 49	18 24	19 05	21 59	23 15	24 25	00 25
56	17 48	18 25	19 09	22 05	23 22	24 34	00 34
58	17 47	18 26	19 13	22 12	23 31	24 45	00 45
S 60	17 47	18 28	19 17	22 20	23 41	24 56	00 56

Day	SUN Eqn. of Time 00ʰ	SUN Eqn. of Time 12ʰ	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
	m s	m s	h m	h m	h m	d	
16	04 57	05 08	11 55	14 32	02 05	03	
17	05 19	05 29	11 55	15 27	03 00	04	◐
18	05 40	05 50	11 54	16 24	03 56	05	

1977 SEPTEMBER 19, 20, 21 (MON., TUES., WED.)

	G.M.T.	ARIES	VENUS −3.4		MARS +0.9		JUPITER −1.8		SATURN +0.8	
		G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
	d h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
	19 00	357 47.1	209 40.4	N13 40.4	256 03.3	N23 22.8	263 16.3	N22 59.4	210 10.7	N14 13.2
	01	12 49.5	224 39.9	39.5	271 04.2	22.7	278 18.4	59.4	225 12.8	13.1
	02	27 52.0	239 39.4	38.6	286 05.1	22.6	293 20.6	59.4	240 15.0	13.1
	03	42 54.5	254 38.9	· · 37.7	301 06.0	· · 22.6	308 22.8	· · 59.4	255 17.2	· · 13.0
	04	57 56.9	269 38.3	36.7	316 06.9	22.5	323 25.0	59.4	270 19.4	12.9
	05	72 59.4	284 37.8	35.8	331 07.8	22.4	338 27.1	59.4	285 21.6	12.8
	06	88 01.9	299 37.3	N13 34.9	346 08.7	N23 22.4	353 29.3	N22 59.4	300 23.7	N14 12.7
	07	103 04.3	314 36.8	34.0	1 09.6	22.3	8 31.5	59.4	315 25.9	12.6
	08	118 06.8	329 36.3	33.0	16 10.5	22.2	23 33.7	59.4	330 28.1	12.5
M	09	133 09.3	344 35.8	· · 32.1	31 11.5	· · 22.2	38 35.8	· · 59.4	345 30.3	· · 12.4
O	10	148 11.7	359 35.3	31.2	46 12.4	22.1	53 38.0	59.3	0 32.5	12.3
N	11	163 14.2	14 34.8	30.2	61 13.3	22.0	68 40.2	59.3	15 34.6	12.2
D	12	178 16.7	29 34.3	N13 29.3	76 14.2	N23 22.0	83 42.4	N22 59.3	30 36.8	N14 12.1
A	13	193 19.1	44 33.8	28.4	91 15.1	21.9	98 44.5	59.3	45 39.0	12.0
Y	14	208 21.6	59 33.3	27.5	106 16.0	21.8	113 46.7	59.3	60 41.2	11.9
	15	223 24.0	74 32.8	· · 26.5	121 16.9	· · 21.8	128 48.9	· · 59.3	75 43.4	· · 11.9
	16	238 26.5	89 32.3	25.6	136 17.8	21.7	143 51.1	59.3	90 45.6	11.8
	17	253 29.0	104 31.8	24.7	151 18.7	21.6	158 53.2	59.3	105 47.7	11.7
	18	268 31.4	119 31.3	N13 23.7	166 19.6	N23 21.6	173 55.4	N22 59.3	120 49.9	N14 11.6
	19	283 33.9	134 30.8	22.8	181 20.5	21.5	188 57.6	59.3	135 52.1	11.5
	20	298 36.4	149 30.3	21.8	196 21.4	21.4	203 59.8	59.3	150 54.3	11.4
	21	313 38.8	164 29.8	· · 20.9	211 22.3	· · 21.4	219 02.0	· · 59.3	165 56.5	· · 11.3
	22	328 41.3	179 29.3	20.0	226 23.2	21.3	234 04.1	59.3	180 58.6	11.2
	23	343 43.8	194 28.8	19.0	241 24.1	21.2	249 06.3	59.3	196 00.8	11.1
	20 00	358 46.2	209 28.3	N13 18.1	256 25.0	N23 21.1	264 08.5	N22 59.3	211 03.0	N14 11.0
	01	13 48.7	224 27.8	17.2	271 25.9	21.1	279 10.7	59.2	226 05.2	10.9
	02	28 51.2	239 27.3	16.2	286 26.8	21.0	294 12.9	59.2	241 07.4	10.8
	03	43 53.6	254 26.8	· · 15.3	301 27.8	· · 20.9	309 15.0	· · 59.2	256 09.6	· · 10.8
	04	58 56.1	269 26.3	14.3	316 28.7	20.9	324 17.2	59.2	271 11.7	10.7
	05	73 58.5	284 25.8	13.4	331 29.6	20.8	339 19.4	59.2	286 13.9	10.6
	06	89 01.0	299 25.3	N13 12.5	346 30.5	N23 20.7	354 21.6	N22 59.2	301 16.1	N14 10.5
	07	104 03.5	314 24.8	11.5	1 31.4	20.6	9 23.8	59.2	316 18.3	10.4
T	08	119 05.9	329 24.3	10.6	16 32.3	20.6	24 25.9	59.2	331 20.5	10.3
U	09	134 08.4	344 23.8	· · 09.6	31 33.2	· · 20.5	39 28.1	· · 59.2	346 22.7	· · 10.2
E	10	149 10.9	359 23.3	08.7	46 34.1	20.4	54 30.3	59.2	1 24.8	10.1
S	11	164 13.3	14 22.8	07.7	61 35.0	20.4	69 32.5	59.2	16 27.0	10.0
D	12	179 15.8	29 22.3	N13 06.8	76 36.0	N23 20.3	84 34.7	N22 59.2	31 29.2	N14 09.9
A	13	194 18.3	44 21.8	05.8	91 36.9	20.2	99 36.9	59.2	46 31.4	09.8
Y	14	209 20.7	59 21.3	04.9	106 37.8	20.1	114 39.0	59.2	61 33.6	09.7
	15	224 23.2	74 20.8	· · 03.9	121 38.7	· · 20.1	129 41.2	· · 59.1	76 35.8	· · 09.7
	16	239 25.6	89 20.3	03.0	136 39.6	20.0	144 43.4	59.1	91 37.9	09.6
	17	254 28.1	104 19.9	02.1	151 40.5	19.9	159 45.6	59.1	106 40.1	09.5
	18	269 30.6	119 19.4	N13 01.1	166 41.4	N23 19.8	174 47.8	N22 59.1	121 42.3	N14 09.4
	19	284 33.0	134 18.9	13 00.1	181 42.3	19.8	189 50.0	59.1	136 44.5	09.3
	20	299 35.5	149 18.4	12 59.2	196 43.3	19.7	204 52.1	59.1	151 46.7	09.2
	21	314 38.0	164 17.9	· · 58.2	211 44.2	· · 19.6	219 54.3	· · 59.1	166 48.9	· · 09.1
	22	329 40.4	179 17.4	57.3	226 45.1	19.5	234 56.5	59.1	181 51.0	09.0
	23	344 42.9	194 16.9	56.3	241 46.0	19.5	249 58.7	59.1	196 53.2	08.9
	21 00	359 45.4	209 16.4	N12 55.4	256 46.9	N23 19.4	265 00.9	N22 59.1	211 55.4	N14 08.8
	01	14 47.8	224 15.9	54.4	271 47.8	19.3	280 03.1	59.1	226 57.6	08.7
	02	29 50.3	239 15.4	53.5	286 48.8	19.2	295 05.3	59.1	241 59.8	08.7
	03	44 52.8	254 14.9	· · 52.5	301 49.7	· · 19.2	310 07.4	· · 59.1	257 02.0	· · 08.6
	04	59 55.2	269 14.4	51.6	316 50.6	19.1	325 09.6	59.1	272 04.1	08.5
	05	74 57.7	284 13.9	50.6	331 51.5	19.0	340 11.8	59.1	287 06.3	08.4
	06	90 00.1	299 13.4	N12 49.6	346 52.4	N23 18.9	355 14.0	N22 59.0	302 08.5	N14 08.3
W	07	105 02.6	314 13.0	48.7	1 53.4	18.9	10 16.2	59.0	317 10.7	08.2
E	08	120 05.1	329 12.5	47.7	16 54.3	18.8	25 18.4	59.0	332 12.9	08.1
D	09	135 07.5	344 12.0	· · 46.8	31 55.2	· · 18.7	40 20.6	· · 59.0	347 15.1	· · 08.0
N	10	150 10.0	359 11.5	45.8	46 56.1	18.6	55 22.8	59.0	2 17.3	07.9
E	11	165 12.5	14 11.0	44.9	61 57.0	18.6	70 25.0	59.0	17 19.4	07.8
S	12	180 14.9	29 10.5	N12 43.9	76 58.0	N23 18.5	85 27.1	N22 59.0	32 21.6	N14 07.7
D	13	195 17.4	44 10.0	42.9	91 58.9	18.4	100 29.3	59.0	47 23.8	07.7
A	14	210 19.9	59 09.5	42.0	106 59.8	18.3	115 31.5	59.0	62 26.0	07.6
Y	15	225 22.3	74 09.0	· · 41.0	122 00.7	· · 18.2	130 33.7	· · 59.0	77 28.2	· · 07.5
	16	240 24.8	89 08.6	40.0	137 01.6	18.2	145 35.9	59.0	92 30.4	07.4
	17	255 27.3	104 08.1	39.1	152 02.6	18.1	160 38.1	59.0	107 32.5	07.3
	18	270 29.7	119 07.6	N12 38.1	167 03.5	N23 18.0	175 40.3	N22 59.0	122 34.7	N14 07.2
	19	285 32.2	134 07.1	37.1	182 04.4	17.9	190 42.5	59.0	137 36.9	07.1
	20	300 34.6	149 06.6	36.2	197 05.3	17.8	205 44.7	59.0	152 39.1	07.0
	21	315 37.1	164 06.1	· · 35.2	212 06.3	· · 17.8	220 46.9	· · 58.9	167 41.3	· · 06.9
	22	330 39.6	179 05.6	34.2	227 07.2	17.7	235 49.1	58.9	182 43.5	06.8
	23	345 42.0	194 05.2	33.3	242 08.1	17.6	250 51.3	58.9	197 45.7	06.7
	Mer. Pass.	h m 0 04.9	*v* −0.5	*d* 0.9	*v* 0.9	*d* 0.1	*v* 2.2	*d* 0.0	*v* 2.2	*d* 0.1

STARS		
Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 38.5	S40 23.4
Achernar	335 46.3	S57 20.8
Acrux	173 40.0	S62 58.5
Adhara	255 33.8	S28 56.3
Aldebaran	291 20.2	N16 27.9
Alioth	166 44.9	N56 05.0
Alkaid	153 20.6	N49 25.7
Al Na'ir	28 17.1	S47 04.1
Alnilam	276 13.7	S 1 12.9
Alphard	218 22.8	S 8 33.6
Alphecca	126 34.0	N26 47.7
Alpheratz	358 11.0	N28 58.2
Altair	62 34.3	N 8 48.8
Ankaa	353 41.9	S42 25.5
Antares	112 59.4	S26 22.9
Arcturus	146 20.6	N19 18.1
Atria	108 25.6	S68 59.4
Avior	234 29.3	S59 26.1
Bellatrix	279 00.9	N 6 19.8
Betelgeuse	271 30.5	N 7 24.2
Canopus	264 08.2	S52 40.8
Capella	281 14.2	N45 58.4
Deneb	49 49.5	N45 12.4
Denebola	183 01.4	N14 41.9
Diphda	349 22.6	S18 06.4
Dubhe	194 25.4	N61 52.2
Elnath	278 46.6	N28 35.2
Eltanin	90 58.7	N51 29.9
Enif	34 13.3	N 9 46.6
Fomalhaut	15 53.3	S29 44.3
Gacrux	172 31.5	S56 59.3
Gienah	176 20.3	S17 25.0
Hadar	149 26.6	S60 16.0
Hamal	328 30.9	N23 21.5
Kaus Aust.	84 19.5	S34 23.7
Kochab	137 19.9	N74 15.1
Markab	14 04.8	N15 05.3
Menkar	314 43.0	N 4 00.2
Menkent	148 39.7	S36 15.6
Miaplacidus	221 46.0	S69 37.4
Mirfak	309 18.6	N49 46.8
Nunki	76 31.6	S26 19.4
Peacock	54 01.3	S56 48.5
Pollux	244 00.8	N28 04.7
Procyon	245 28.0	N 5 17.0
Rasalhague	96 31.5	N12 34.9
Regulus	208 12.4	N12 04.6
Rigel	281 37.9	S 8 13.5
Rigil Kent.	140 28.9	S60 44.6
Sabik	102 43.5	S15 41.7
Schedar	350 10.7	N56 25.0
Shaula	96 58.5	S37 05.3
Sirius	258 57.6	S16 41.0
Spica	158 59.9	S11 02.6
Suhail	223 12.5	S43 20.4
Vega	80 57.1	N38 46.2
Zuben'ubi	137 35.5	S15 56.9

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	210 42.1	10 02
Mars	257 38.8	6 54
Jupiter	265 22.3	6 23
Saturn	212 16.8	9 54

G.M.T.		SUN G.H.A.	SUN Dec.	MOON G.H.A.	MOON v	MOON Dec.	MOON d	MOON H.P.
d	h	° ′	° ′	° ′	′	° ′	′	′
19	00	181 30.4	N 1 36.7	109 34.6	6.3	S17 37.7	3.3	59.4
	01	196 30.6	35.7	123 59.9	6.3	17 41.0	3.2	59.4
	02	211 30.8	34.8	138 25.2	6.2	17 44.2	3.0	59.4
	03	226 31.0	·· 33.8	152 50.4	6.3	17 47.2	3.0	59.4
	04	241 31.3	32.8	167 15.7	6.2	17 50.2	2.8	59.4
	05	256 31.5	31.8	181 40.9	6.2	17 53.0	2.7	59.4
	06	271 31.7	N 1 30.9	196 06.1	6.2	S17 55.7	2.6	59.4
	07	286 31.9	29.9	210 31.3	6.2	17 58.3	2.5	59.4
	08	301 32.2	28.9	224 56.5	6.2	18 00.8	2.3	59.4
M	09	316 32.4	·· 28.0	239 21.7	6.2	18 03.1	2.3	59.4
O	10	331 32.6	27.0	253 46.9	6.2	18 05.4	2.1	59.4
N	11	346 32.8	26.0	268 12.1	6.1	18 07.5	2.0	59.3
D	12	1 33.0	N 1 25.1	282 37.2	6.2	S18 09.5	1.9	59.3
A	13	16 33.3	24.1	297 02.4	6.1	18 11.4	1.7	59.3
Y	14	31 33.5	23.1	311 27.5	6.2	18 13.1	1.6	59.3
	15	46 33.7	·· 22.1	325 52.7	6.1	18 14.7	1.6	59.3
	16	61 33.9	21.2	340 17.8	6.1	18 16.3	1.3	59.3
	17	76 34.2	20.2	354 42.9	6.2	18 17.6	1.3	59.3
	18	91 34.4	N 1 19.2	9 08.1	6.1	S18 18.9	1.2	59.3
	19	106 34.6	18.3	23 33.2	6.1	18 20.1	1.0	59.3
	20	121 34.8	17.3	37 58.3	6.2	18 21.1	0.9	59.3
	21	136 35.0	·· 16.3	52 23.5	6.1	18 22.0	0.8	59.3
	22	151 35.3	15.4	66 48.6	6.1	18 22.8	0.6	59.3
	23	166 35.5	14.4	81 13.7	6.2	18 23.4	0.6	59.3
20	00	181 35.7	N 1 13.4	95 38.9	6.1	S18 24.0	0.4	59.3
	01	196 35.9	12.4	110 04.0	6.2	18 24.4	0.3	59.3
	02	211 36.1	11.5	124 29.2	6.1	18 24.7	0.2	59.3
	03	226 36.4	·· 10.5	138 54.3	6.2	18 24.9	0.0	59.3
	04	241 36.6	09.5	153 19.5	6.1	18 24.9	0.0	59.3
	05	256 36.8	08.6	167 44.6	6.2	18 24.9	0.2	59.2
	06	271 37.0	N 1 07.6	182 09.8	6.2	S18 24.7	0.3	59.2
	07	286 37.2	06.6	196 35.0	6.2	18 24.4	0.4	59.2
	08	301 37.5	05.6	211 00.2	6.2	18 24.0	0.6	59.2
T	09	316 37.7	·· 04.7	225 25.4	6.3	18 23.4	0.7	59.2
U	10	331 37.9	03.7	239 50.7	6.2	18 22.7	0.8	59.2
E	11	346 38.1	02.7	254 15.9	6.3	18 21.9	0.9	59.2
S	12	1 38.4	N 1 01.8	268 41.2	6.2	S18 21.0	1.0	59.2
D	13	16 38.6	1 00.8	283 06.4	6.3	18 20.0	1.2	59.2
A	14	31 38.8	0 59.8	297 31.7	6.3	18 18.8	1.2	59.2
Y	15	46 39.0	·· 58.8	311 57.0	6.4	18 17.6	1.4	59.2
	16	61 39.2	57.9	326 22.4	6.3	18 16.2	1.5	59.2
	17	76 39.5	56.9	340 47.7	6.4	18 14.7	1.6	59.2
	18	91 39.7	N 0 55.9	355 13.1	6.4	S18 13.1	1.8	59.2
	19	106 39.9	55.0	9 38.5	6.4	18 11.3	1.9	59.1
	20	121 40.1	54.0	24 03.9	6.4	18 09.4	1.9	59.1
	21	136 40.3	·· 53.0	38 29.3	6.5	18 07.5	2.1	59.1
	22	151 40.6	52.0	52 54.8	6.5	18 05.4	2.2	59.1
	23	166 40.8	51.1	67 20.3	6.5	18 03.2	2.4	59.1
21	00	181 41.0	N 0 50.1	81 45.8	6.5	S18 00.8	2.4	59.1
	01	196 41.2	49.1	96 11.3	6.6	17 58.4	2.6	59.1
	02	211 41.4	48.2	110 36.9	6.6	17 55.8	2.7	59.1
	03	226 41.7	·· 47.2	125 02.5	6.6	17 53.1	2.8	59.1
	04	241 41.9	46.2	139 28.1	6.7	17 50.3	2.9	59.1
	05	256 42.1	45.2	153 53.8	6.7	17 47.4	3.0	59.1
	06	271 42.3	N 0 44.3	168 19.5	6.7	S17 44.4	3.1	59.0
	07	286 42.6	43.3	182 45.2	6.8	17 41.3	3.3	59.0
W	08	301 42.8	42.3	197 11.0	6.7	17 38.0	3.3	59.0
E	09	316 43.0	·· 41.4	211 36.7	6.9	17 34.7	3.5	59.0
D	10	331 43.2	40.4	226 02.6	6.8	17 31.2	3.6	59.0
N	11	346 43.4	39.4	240 28.4	6.9	17 27.6	3.7	59.0
E	12	1 43.7	N 0 38.4	254 54.3	6.9	S17 23.9	3.8	59.0
S	13	16 43.9	37.5	269 20.2	7.0	17 20.1	3.9	59.0
D	14	31 44.1	36.5	283 46.2	7.0	17 16.2	4.0	59.0
A	15	46 44.3	·· 35.5	298 12.2	7.1	17 12.2	4.1	58.9
Y	16	61 44.5	34.5	312 38.3	7.0	17 08.1	4.3	58.9
	17	76 44.8	33.6	327 04.3	7.2	17 03.8	4.3	58.9
	18	91 45.0	N 0 32.6	341 30.5	7.1	S16 59.5	4.4	58.9
	19	106 45.2	31.6	355 56.6	7.2	16 55.1	4.6	58.9
	20	121 45.4	30.7	10 22.8	7.3	16 50.5	4.6	58.9
	21	136 45.6	·· 29.7	24 49.1	7.3	16 45.9	4.8	58.9
	22	151 45.9	28.7	39 15.4	7.3	16 41.1	4.9	58.9
	23	166 46.1	27.7	53 41.7	7.4	16 36.2	4.9	58.9
		S.D. 16.0	*d* 1.0	S.D. 16.2		16.1		16.1

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 19	Moonrise 20	Moonrise 21	Moonrise 22
°	h m	h m	h m	h m	h m	h m	h m
N 72	02 44	04 19	05 29	■	■	18 01	17 47
N 70	03 07	04 29	05 31	15 43	16 40	17 05	17 15
68	03 24	04 37	05 33	14 58	15 57	16 32	16 51
66	03 38	04 43	05 35	14 29	15 27	16 07	16 33
64	03 49	04 49	05 37	14 06	15 05	15 48	16 18
62	03 59	04 53	05 38	13 48	14 47	15 32	16 05
60	04 06	04 57	05 39	13 34	14 33	15 19	15 55
N 58	04 13	05 01	05 40	13 21	14 20	15 08	15 45
56	04 19	05 04	05 41	13 10	14 09	14 58	15 37
54	04 24	05 06	05 42	13 01	13 59	14 49	15 30
52	04 28	05 09	05 42	12 52	13 51	14 41	15 23
50	04 32	05 11	05 43	12 44	13 43	14 34	15 17
45	04 40	05 15	05 44	12 28	13 27	14 19	15 04
N 40	04 47	05 18	05 45	12 15	13 14	14 06	14 54
35	04 51	05 21	05 46	12 04	13 02	13 56	14 44
30	04 55	05 23	05 47	11 54	12 52	13 47	14 36
20	05 01	05 26	05 48	11 37	12 35	13 31	14 23
N 10	05 04	05 28	05 49	11 22	12 20	13 17	14 10
0	05 06	05 30	05 50	11 08	12 06	13 03	13 59
S 10	05 06	05 30	05 51	10 54	11 52	12 50	13 48
20	05 04	05 30	05 52	10 40	11 37	12 36	13 36
30	05 01	05 28	05 52	10 23	11 20	12 20	13 22
35	04 58	05 27	05 53	10 13	11 10	12 11	13 13
40	04 55	05 26	05 53	10 02	10 59	12 00	13 04
45	04 50	05 24	05 53	09 49	10 46	11 48	12 53
S 50	04 44	05 22	05 54	09 33	10 30	11 33	12 40
52	04 41	05 20	05 54	09 26	10 22	11 25	12 34
54	04 37	05 19	05 54	09 18	10 14	11 17	12 27
56	04 34	05 17	05 54	09 09	10 04	11 09	12 20
58	04 29	05 15	05 54	08 58	09 53	10 59	12 11
S 60	04 24	05 13	05 55	08 46	09 41	10 47	12 02

Lat.	Sunset	Twilight Civil	Twilight Naut.	Moonset 19	Moonset 20	Moonset 21	Moonset 22
°	h m	h m	h m	h m	h m	h m	h m
N 72	18 16	19 24	20 58	■	■	20 42	22 50
N 70	18 13	19 15	20 36	18 59	20 02	21 36	23 21
68	18 11	19 08	20 19	19 44	20 46	22 10	23 44
66	18 10	19 01	20 06	20 14	21 15	22 34	24 02
64	18 09	18 56	19 55	20 36	21 37	22 52	24 16
62	18 07	18 52	19 46	20 54	21 55	23 08	24 28
60	18 06	18 48	19 39	21 09	22 09	23 20	24 38
N 58	18 06	18 45	19 32	21 21	22 22	23 31	24 47
56	18 05	18 42	19 26	21 32	22 33	23 41	24 55
54	18 04	18 39	19 22	21 42	22 42	23 49	25 02
52	18 04	18 37	19 17	21 51	22 50	23 57	25 08
50	18 03	18 35	19 13	21 58	22 58	24 04	00 04
45	18 02	18 31	19 06	22 15	23 14	24 18	00 18
N 40	18 01	18 28	19 00	22 28	23 27	24 30	00 30
35	18 00	18 25	18 55	22 40	23 39	24 40	00 40
30	17 59	18 23	18 51	22 50	23 48	24 49	00 49
20	17 58	18 20	18 46	23 07	24 05	00 05	01 05
N 10	17 57	18 18	18 43	23 22	24 20	00 20	01 18
0	17 57	18 17	18 41	23 36	24 34	00 34	01 30
S 10	17 56	18 17	18 41	23 50	24 47	00 47	01 43
20	17 56	18 18	18 43	24 05	00 05	01 02	01 56
30	17 55	18 19	18 47	24 22	00 22	01 18	02 11
35	17 55	18 20	18 50	24 32	00 32	01 28	02 19
40	17 55	18 22	18 53	24 43	00 43	01 39	02 29
45	17 54	18 24	18 58	24 56	00 56	01 52	02 41
S 50	17 54	18 26	19 04	00 10	01 13	02 07	02 54
52	17 54	18 28	19 07	00 17	01 20	02 15	03 01
54	17 54	18 29	19 11	00 25	01 29	02 23	03 08
56	17 54	18 31	19 15	00 34	01 38	02 32	03 16
58	17 54	18 33	19 19	00 45	01 49	02 42	03 25
S 60	17 54	18 35	19 25	00 56	02 01	02 54	03 35

Day	SUN Eqn. of Time 00ʰ	SUN Eqn. of Time 12ʰ	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
	m s	m s	h m	h m	h m	d	
19	06 01	06 12	11 54	17 22	04 53	06	
20	06 22	06 33	11 53	18 20	05 51	07	◐
21	06 44	06 54	11 53	19 17	06 49	08	

1977 SEPTEMBER 22, 23, 24 (THURS., FRI., SAT.)

	G.M.T.	ARIES	VENUS −3.4		MARS +0.9		JUPITER −1.9		SATURN +0.8	
	d h	G.H.A. ° ′	G.H.A. ° ′	Dec. ° ′	G.H.A. ° ′	Dec. ° ′	G.H.A. ° ′	Dec. ° ′	G.H.A. ° ′	Dec. ° ′
	22 00	0 44.5	209 04.7	N12 32.3	257 09.0	N23 17.5	265 53.5	N22 58.9	212 47.8	N14 06.7
	01	15 47.0	224 04.2	31.3	272 10.0	17.4	280 55.6	58.9	227 50.0	06.6
	02	30 49.4	239 03.7	30.4	287 10.9	17.4	295 57.8	58.9	242 52.2	06.5
	03	45 51.9	254 03.2	·· 29.4	302 11.8	·· 17.3	311 00.0	·· 58.9	257 54.4	·· 06.4
	04	60 54.4	269 02.7	28.4	317 12.7	17.2	326 02.2	58.9	272 56.6	06.3
	05	75 56.8	284 02.2	27.4	332 13.7	17.1	341 04.4	58.9	287 58.8	06.2
	06	90 59.3	299 01.8	N12 26.5	347 14.6	N23 17.0	356 06.6	N22 58.9	303 01.0	N14 06.1
	07	106 01.7	314 01.3	25.5	2 15.5	17.0	11 08.8	58.9	318 03.1	06.0
T	08	121 04.2	329 00.8	24.5	17 16.4	16.9	26 11.0	58.9	333 05.3	05.9
H	09	136 06.7	344 00.3	·· 23.5	32 17.4	·· 16.8	41 13.2	·· 58.9	348 07.5	·· 05.8
U	10	151 09.1	358 59.8	22.6	47 18.3	16.7	56 15.4	58.9	3 09.7	05.7
R	11	166 11.6	13 59.3	21.6	62 19.2	16.6	71 17.6	58.8	18 11.9	05.7
S	12	181 14.1	28 58.9	N12 20.6	77 20.2	N23 16.6	86 19.8	N22 58.8	33 14.1	N14 05.6
D	13	196 16.5	43 58.4	19.6	92 21.1	16.5	101 22.0	58.8	48 16.3	05.5
A	14	211 19.0	58 57.9	18.7	107 22.0	16.4	116 24.2	58.8	63 18.5	05.4
Y	15	226 21.5	73 57.4	·· 17.7	122 22.9	·· 16.3	131 26.4	·· 58.8	78 20.6	·· 05.3
	16	241 23.9	88 56.9	16.7	137 23.9	16.2	146 28.6	58.8	93 22.8	05.2
	17	256 26.4	103 56.5	15.7	152 24.8	16.1	161 30.8	58.8	108 25.0	05.1
	18	271 28.9	118 56.0	N12 14.7	167 25.7	N23 16.1	176 33.0	N22 58.8	123 27.2	N14 05.0
	19	286 31.3	133 55.5	13.8	182 26.7	16.0	191 35.2	58.8	138 29.4	04.9
	20	301 33.8	148 55.0	12.8	197 27.6	15.9	206 37.4	58.8	153 31.6	04.8
	21	316 36.2	163 54.5	·· 11.8	212 28.5	·· 15.8	221 39.6	·· 58.8	168 33.8	·· 04.8
	22	331 38.7	178 54.1	10.8	227 29.5	15.7	236 41.8	58.8	183 36.0	04.7
	23	346 41.2	193 53.6	09.8	242 30.4	15.6	251 44.0	58.8	198 38.1	04.6
	23 00	1 43.6	208 53.1	N12 08.8	257 31.3	N23 15.5	266 46.2	N22 58.8	213 40.3	N14 04.5
	01	16 46.1	223 52.6	07.9	272 32.3	15.5	281 48.4	58.8	228 42.5	04.4
	02	31 48.6	238 52.1	06.9	287 33.2	15.4	296 50.6	58.7	243 44.7	04.3
	03	46 51.0	253 51.7	·· 05.9	302 34.1	·· 15.3	311 52.8	·· 58.7	258 46.9	·· 04.2
	04	61 53.5	268 51.2	04.9	317 35.1	15.2	326 55.0	58.7	273 49.1	04.1
	05	76 56.0	283 50.7	03.9	332 36.0	15.1	341 57.2	58.7	288 51.3	04.0
	06	91 58.4	298 50.2	N12 02.9	347 36.9	N23 15.0	356 59.4	N22 58.7	303 53.5	N14 03.9
	07	107 00.9	313 49.8	01.9	2 37.9	14.9	12 01.6	58.7	318 55.6	03.9
	08	122 03.4	328 49.3	01.0	17 38.8	14.9	27 03.8	58.7	333 57.8	03.8
F	09	137 05.8	343 48.8	12 00.0	32 39.7	·· 14.8	42 06.0	·· 58.7	349 00.0	·· 03.7
R	10	152 08.3	358 48.3	11 59.0	47 40.7	14.7	57 08.2	58.7	4 02.2	03.6
I	11	167 10.7	13 47.9	58.0	62 41.6	14.6	72 10.4	58.7	19 04.4	03.5
D	12	182 13.2	28 47.4	N11 57.0	77 42.6	N23 14.5	87 12.6	N22 58.7	34 06.6	N14 03.4
A	13	197 15.7	43 46.9	56.0	92 43.5	14.4	102 14.8	58.7	49 08.8	03.3
Y	14	212 18.1	58 46.4	55.0	107 44.4	14.3	117 17.0	58.7	64 11.0	03.2
	15	227 20.6	73 46.0	·· 54.0	122 45.4	·· 14.2	132 19.2	·· 58.7	79 13.2	·· 03.1
	16	242 23.1	88 45.5	53.0	137 46.3	14.2	147 21.4	58.7	94 15.3	03.0
	17	257 25.5	103 45.0	52.0	152 47.3	14.1	162 23.7	58.6	109 17.5	03.0
	18	272 28.0	118 44.5	N11 51.0	167 48.2	N23 14.0	177 25.9	N22 58.6	124 19.7	N14 02.9
	19	287 30.5	133 44.1	50.0	182 49.1	13.9	192 28.1	58.6	139 21.9	02.8
	20	302 32.9	148 43.6	49.0	197 50.1	13.8	207 30.3	58.6	154 24.1	02.7
	21	317 35.4	163 43.1	·· 48.0	212 51.0	·· 13.7	222 32.5	·· 58.6	169 26.3	·· 02.6
	22	332 37.8	178 42.6	47.0	227 52.0	13.6	237 34.7	58.6	184 28.5	02.5
	23	347 40.3	193 42.2	46.0	242 52.9	13.5	252 36.9	58.6	199 30.7	02.4
	24 00	2 42.8	208 41.7	N11 45.0	257 53.8	N23 13.4	267 39.1	N22 58.6	214 32.9	N14 02.3
	01	17 45.2	223 41.2	44.0	272 54.8	13.4	282 41.3	58.6	229 35.0	02.2
	02	32 47.7	238 40.8	43.0	287 55.7	13.3	297 43.5	58.6	244 37.2	02.2
	03	47 50.2	253 40.3	·· 42.0	302 56.7	·· 13.2	312 45.7	·· 58.6	259 39.4	·· 02.1
	04	62 52.6	268 39.8	41.0	317 57.6	13.1	327 47.9	58.6	274 41.6	02.0
	05	77 55.1	283 39.3	40.0	332 58.6	13.0	342 50.2	58.6	289 43.8	01.9
	06	92 57.6	298 38.9	N11 39.0	347 59.5	N23 12.9	357 52.4	N22 58.6	304 46.0	N14 01.8
	07	108 00.0	313 38.4	38.0	3 00.5	12.8	12 54.6	58.6	319 48.2	01.7
S	08	123 02.5	328 37.9	37.0	18 01.4	12.7	27 56.8	58.5	334 50.4	01.6
A	09	138 05.0	343 37.5	·· 36.0	33 02.3	·· 12.6	42 59.0	·· 58.5	349 52.6	·· 01.5
T	10	153 07.4	358 37.0	35.0	48 03.3	12.5	58 01.2	58.5	4 54.8	01.4
U	11	168 09.9	13 36.5	34.0	63 04.2	12.5	73 03.4	58.5	19 56.9	01.3
R	12	183 12.3	28 36.1	N11 33.0	78 05.2	N23 12.4	88 05.6	N22 58.5	34 59.1	N14 01.3
D	13	198 14.8	43 35.6	32.0	93 06.1	12.3	103 07.8	58.5	50 01.3	01.2
A	14	213 17.3	58 35.1	31.0	108 07.1	12.2	118 10.1	58.5	65 03.5	01.1
Y	15	228 19.7	73 34.6	·· 30.0	123 08.0	·· 12.1	133 12.3	·· 58.5	80 05.7	·· 01.0
	16	243 22.2	88 34.2	29.0	138 09.0	12.0	148 14.5	58.5	95 07.9	00.9
	17	258 24.7	103 33.7	28.0	153 09.9	11.9	163 16.7	58.5	110 10.1	00.8
	18	273 27.1	118 33.2	N11 27.0	168 10.9	N23 11.8	178 18.9	N22 58.5	125 12.3	N14 00.7
	19	288 29.6	133 32.8	26.0	183 11.8	11.7	193 21.1	58.5	140 14.5	00.6
	20	303 32.1	148 32.3	24.9	198 12.8	11.6	208 23.3	58.5	155 16.7	00.5
	21	318 34.5	163 31.8	·· 23.9	213 13.7	·· 11.5	223 25.6	·· 58.5	170 18.9	·· 00.5
	22	333 37.0	178 31.4	22.9	228 14.7	11.4	238 27.8	58.5	185 21.0	00.4
	23	348 39.5	193 30.9	21.9	243 15.6	11.3	253 30.0	58.4	200 23.2	00.3
	Mer. Pass.	h m 23 49.2	*v* 0.5	*d* 1.0	*v* 0.9	*d* 0.1	*v* 2.2	*d* 0.0	*v* 2.2	*d* 0.1

STARS		
Name	S.H.A. ° ′	Dec. ° ′
Acamar	315 38.5	S40 23.4
Achernar	335 46.3	S57 20.8
Acrux	173 40.0	S62 58.5
Adhara	255 33.8	S28 56.3
Aldebaran	291 20.2	N16 27.9
Alioth	166 44.9	N56 05.0
Alkaid	153 20.6	N49 25.7
Al Na'ir	28 17.1	S47 04.1
Alnilam	276 13.7	S 1 12.9
Alphard	218 22.8	S 8 33.6
Alphecca	126 34.0	N26 47.7
Alpheratz	358 11.0	N28 58.2
Altair	62 34.3	N 8 48.8
Ankaa	353 41.8	S42 25.5
Antares	112 59.5	S26 22.9
Arcturus	146 20.6	N19 18.1
Atria	108 25.6	S68 59.4
Avior	234 29.3	S59 26.1
Bellatrix	279 00.8	N 6 19.8
Betelgeuse	271 30.4	N 7 24.2
Canopus	264 08.1	S52 40.8
Capella	281 14.2	N45 58.4
Deneb	49 49.5	N45 12.4
Denebola	183 01.4	N14 41.9
Diphda	349 22.6	S18 06.4
Dubhe	194 25.3	N61 52.2
Elnath	278 46.6	N28 35.2
Eltanin	90 58.7	N51 29.9
Enif	34 13.3	N 9 46.6
Fomalhaut	15 53.3	S29 44.3
Gacrux	172 31.5	S56 59.3
Gienah	176 20.3	S17 25.0
Hadar	149 26.7	S60 16.0
Hamal	328 30.9	N23 21.5
Kaus Aust.	84 19.5	S34 23.7
Kochab	137 19.9	N74 15.1
Markab	14 04.8	N15 05.3
Menkar	314 43.0	N 4 00.2
Menkent	148 39.7	S36 15.6
Miaplacidus	221 45.9	S69 37.4
Mirfak	309 18.6	N49 46.8
Nunki	76 31.6	S26 19.4
Peacock	54 01.3	S56 48.5
Pollux	244 00.8	N28 04.7
Procyon	245 28.0	N 5 17.0
Rasalhague	96 31.5	N12 34.9
Regulus	208 12.4	N12 04.6
Rigel	281 37.9	S 8 13.5
Rigil Kent.	140 29.0	S60 44.6
Sabik	102 43.5	S15 41.7
Schedar	350 10.7	N56 25.0
Shaula	96 58.5	S37 05.3
Sirius	258 57.5	S16 41.0
Spica	158 59.9	S11 02.6
Suhail	223 12.5	S43 20.4
Vega	80 57.1	N38 46.2
Zuben'ubi	137 35.5	S15 56.9

	S.H.A. ° ′	Mer. Pass. h m
Venus	207 09.5	10 05
Mars	255 47.7	6 49
Jupiter	265 02.6	6 12
Saturn	211 56.7	9 44

1977 SEPTEMBER 22, 23, 24 (THURS., FRI., SAT.)

	G.M.T.	SUN G.H.A.	SUN Dec.	MOON G.H.A.	MOON v	MOON Dec.	MOON d	MOON H.P.
	d h	° ′	° ′	° ′	′	° ′	′	′
	22 00	181 46.3	N 0 26.8	68 08.1	7.4	S16 31.3	5.1	58.8
	01	196 46.5	25.8	82 34.5	7.5	16 26.2	5.1	58.8
	02	211 46.7	24.8	97 01.0	7.5	16 21.1	5.3	58.8
	03	226 47.0	·· 23.8	111 27.5	7.5	16 15.8	5.4	58.8
	04	241 47.2	22.9	125 54.0	7.6	16 10.4	5.4	58.8
	05	256 47.4	21.9	140 20.6	7.7	16 05.0	5.6	58.8
	06	271 47.6	N 0 20.9	154 47.3	7.7	S15 59.4	5.7	58.8
	07	286 47.8	20.0	169 14.0	7.7	15 53.7	5.7	58.8
T	08	301 48.1	19.0	183 40.7	7.8	15 48.0	5.9	58.7
H	09	316 48.3	·· 18.0	198 07.5	7.8	15 42.1	5.9	58.7
U	10	331 48.5	17.0	212 34.3	7.9	15 36.2	6.0	58.7
R	11	346 48.7	16.1	227 01.2	7.9	15 30.2	6.2	58.7
S	12	1 48.9	N 0 15.1	241 28.1	8.0	S15 24.0	6.2	58.7
D	13	16 49.2	14.1	255 55.1	8.0	15 17.8	6.3	58.7
A	14	31 49.4	13.1	270 22.1	8.1	15 11.5	6.4	58.7
Y	15	46 49.6	·· 12.2	284 49.2	8.1	15 05.1	6.5	58.7
	16	61 49.8	11.2	299 16.3	8.2	14 58.6	6.5	58.6
	17	76 50.0	10.2	313 43.5	8.3	14 52.1	6.7	58.6
	18	91 50.3	N 0 09.3	328 10.8	8.2	S14 45.4	6.7	58.6
	19	106 50.5	08.3	342 38.0	8.4	14 38.7	6.9	58.6
	20	121 50.7	07.3	357 05.4	8.3	14 31.8	6.9	58.6
	21	136 50.9	·· 06.3	11 32.7	8.5	14 24.9	7.0	58.6
	22	151 51.1	05.4	26 00.2	8.5	14 17.9	7.1	58.6
	23	166 51.4	04.4	40 27.7	8.5	14 10.8	7.1	58.5
	23 00	181 51.6	N 0 03.4	54 55.2	8.6	S14 03.7	7.3	58.5
	01	196 51.8	02.4	69 22.8	8.6	13 56.4	7.3	58.5
	02	211 52.0	01.5	83 50.4	8.7	13 49.1	7.4	58.5
	03	226 52.2	N 0 00.5	98 18.1	8.7	13 41.7	7.5	58.5
	04	241 52.4	S 0 00.5	112 45.8	8.8	13 34.2	7.5	58.5
	05	256 52.7	01.5	127 13.6	8.9	13 26.7	7.7	58.5
	06	271 52.9	S 0 02.4	141 41.5	8.9	S13 19.0	7.7	58.4
	07	286 53.1	03.4	156 09.4	8.9	13 11.3	7.8	58.4
	08	301 53.3	04.4	170 37.3	9.0	13 03.5	7.8	58.4
F	09	316 53.5	·· 05.3	185 05.3	9.1	12 55.7	7.9	58.4
R	10	331 53.8	06.3	199 33.4	9.1	12 47.8	8.0	58.4
I	11	346 54.0	07.3	214 01.5	9.1	12 39.8	8.1	58.4
D	12	1 54.2	S 0 08.3	228 29.6	9.2	S12 31.7	8.1	58.3
A	13	16 54.4	09.2	242 57.8	9.3	12 23.6	8.2	58.3
Y	14	31 54.6	10.2	257 26.1	9.3	12 15.4	8.3	58.3
	15	46 54.9	·· 11.2	271 54.4	9.3	12 07.1	8.3	58.3
	16	61 55.1	12.2	286 22.7	9.5	11 58.8	8.4	58.3
	17	76 55.3	13.1	300 51.2	9.4	11 50.4	8.5	58.3
	18	91 55.5	S 0 14.1	315 19.6	9.5	S11 41.9	8.5	58.3
	19	106 55.7	15.1	329 48.1	9.6	11 33.4	8.6	58.2
	20	121 55.9	16.1	344 16.7	9.6	11 24.8	8.6	58.2
	21	136 56.2	·· 17.0	358 45.3	9.7	11 16.2	8.7	58.2
	22	151 56.4	18.0	13 14.0	9.7	11 07.5	8.8	58.2
	23	166 56.6	19.0	27 42.7	9.8	10 58.7	8.8	58.2
	24 00	181 56.8	S 0 20.0	42 11.5	9.8	S10 49.9	8.9	58.1
	01	196 57.0	20.9	56 40.3	9.9	10 41.0	8.9	58.1
	02	211 57.3	21.9	71 09.2	9.9	10 32.1	9.0	58.1
	03	226 57.5	·· 22.9	85 38.1	9.9	10 23.1	9.1	58.1
	04	241 57.7	23.8	100 07.0	10.1	10 14.0	9.0	58.1
	05	256 57.9	24.8	114 36.1	10.0	10 05.0	9.2	58.1
	06	271 58.1	S 0 25.8	129 05.1	10.2	S 9 55.8	9.2	58.0
	07	286 58.3	26.8	143 34.3	10.1	9 46.6	9.2	58.0
S	08	301 58.6	27.7	158 03.4	10.2	9 37.4	9.3	58.0
A	09	316 58.8	·· 28.7	172 32.6	10.3	9 28.1	9.3	58.0
T	10	331 59.0	29.7	187 01.9	10.3	9 18.8	9.4	58.0
U	11	346 59.2	30.7	201 31.2	10.4	9 09.4	9.4	58.0
R	12	1 59.4	S 0 31.6	216 00.6	10.4	S 9 00.0	9.5	57.9
D	13	16 59.7	32.6	230 30.0	10.4	8 50.5	9.5	57.9
A	14	31 59.9	33.6	244 59.4	10.5	8 41.0	9.6	57.9
Y	15	47 00.1	·· 34.6	259 28.9	10.6	8 31.4	9.6	57.9
	16	62 00.3	35.5	273 58.5	10.6	8 21.8	9.6	57.9
	17	77 00.5	36.5	288 28.1	10.6	8 12.2	9.7	57.8
	18	92 00.7	S 0 37.5	302 57.7	10.7	S 8 02.5	9.7	57.8
	19	107 01.0	38.5	317 27.4	10.7	7 52.8	9.7	57.8
	20	122 01.2	39.4	331 57.1	10.8	7 43.1	9.8	57.8
	21	137 01.4	·· 40.4	346 26.9	10.8	7 33.3	9.8	57.8
	22	152 01.6	41.4	0 56.7	10.8	7 23.5	9.9	57.7
	23	167 01.8	42.4	15 26.5	10.9	7 13.6	9.9	57.7
		S.D. 16.0	d 1.0	S.D. 16.0		15.9		15.8

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 22	Moonrise 23	Moonrise 24	Moonrise 25
°	h m	h m	h m	h m	h m	h m	h m
N 72	03 03	04 34	05 42	17 47	17 40	17 33	17 28
N 70	03 23	04 42	05 43	17 15	17 19	17 21	17 22
68	03 38	04 48	05 44	16 51	17 03	17 11	17 17
66	03 50	04 53	05 45	16 33	16 50	17 03	17 13
64	03 59	04 58	05 45	16 18	16 40	16 56	17 10
62	04 07	05 01	05 46	16 05	16 30	16 50	17 07
60	04 14	05 04	05 46	15 55	16 22	16 45	17 04
N 58	04 20	05 07	05 46	15 45	16 15	16 40	17 02
56	04 25	05 10	05 47	15 37	16 09	16 36	17 00
54	04 30	05 12	05 47	15 30	16 03	16 32	16 58
52	04 34	05 14	05 47	15 23	15 58	16 29	16 56
50	04 37	05 15	05 47	15 17	15 54	16 26	16 55
45	04 44	05 19	05 48	15 04	15 44	16 19	16 51
N 40	04 50	05 21	05 48	14 54	15 36	16 13	16 48
35	04 54	05 23	05 49	14 44	15 28	16 09	16 46
30	04 57	05 25	05 49	14 36	15 22	16 04	16 44
20	05 01	05 27	05 49	14 23	15 11	15 57	16 40
N 10	05 04	05 28	05 49	14 10	15 02	15 50	16 37
0	05 04	05 28	05 49	13 59	14 53	15 44	16 34
S 10	05 04	05 28	05 49	13 48	14 44	15 38	16 30
20	05 01	05 27	05 49	13 36	14 34	15 31	16 27
30	04 57	05 25	05 49	13 22	14 23	15 24	16 23
35	04 54	05 23	05 48	13 13	14 17	15 19	16 21
40	04 49	05 21	05 48	13 04	14 09	15 15	16 19
45	04 44	05 18	05 48	12 53	14 01	15 09	16 16
S 50	04 37	05 15	05 47	12 40	13 51	15 02	16 12
52	04 33	05 13	05 47	12 34	13 46	14 59	16 11
54	04 30	05 11	05 47	12 27	13 41	14 55	16 09
56	04 25	05 09	05 46	12 20	13 35	14 51	16 07
58	04 20	05 07	05 46	12 11	13 28	14 47	16 05
S 60	04 14	05 04	05 46	12 02	13 21	14 42	16 03

Lat.	Sunset	Twilight Civil	Twilight Naut.	Moonset 22	Moonset 23	Moonset 24	Moonset 25
°	h m	h m	h m	h m	h m	h m	h m
N 72	18 00	19 08	20 37	22 50	24 48	00 48	02 40
N 70	17 59	19 01	20 18	23 21	25 07	01 07	02 50
68	17 59	18 55	20 04	23 44	25 22	01 22	02 58
66	17 58	18 50	19 52	24 02	00 02	01 34	03 05
64	17 58	18 45	19 43	24 16	00 16	01 43	03 11
62	17 58	18 42	19 35	24 28	00 28	01 52	03 16
60	17 57	18 39	19 29	24 38	00 38	01 59	03 20
N 58	17 57	18 36	19 23	24 47	00 47	02 05	03 24
56	17 57	18 34	19 18	24 55	00 55	02 11	03 27
54	17 57	18 32	19 14	25 02	01 02	02 16	03 30
52	17 57	18 30	19 10	25 08	01 08	02 20	03 33
50	17 56	18 29	19 07	00 04	01 13	02 24	03 36
45	17 56	18 25	19 00	00 18	01 25	02 33	03 41
N 40	17 56	18 23	18 54	00 30	01 35	02 40	03 45
35	17 56	18 21	18 50	00 40	01 44	02 47	03 49
30	17 56	18 19	18 47	00 49	01 51	02 52	03 52
20	17 56	18 17	18 43	01 05	02 04	03 02	03 58
N 10	17 56	18 17	18 41	01 18	02 15	03 10	04 03
0	17 56	18 16	18 40	01 30	02 25	03 18	04 08
S 10	17 56	18 17	18 41	01 43	02 35	03 25	04 13
20	17 56	18 18	18 44	01 56	02 46	03 33	04 18
30	17 57	18 21	18 48	02 11	02 58	03 42	04 23
35	17 57	18 22	18 52	02 19	03 06	03 48	04 26
40	17 57	18 24	18 56	02 29	03 14	03 53	04 30
45	17 58	18 27	19 02	02 41	03 23	04 00	04 34
S 50	17 59	18 31	19 09	02 54	03 34	04 09	04 39
52	17 59	18 33	19 13	03 01	03 39	04 12	04 41
54	17 59	18 35	19 17	03 08	03 45	04 16	04 44
56	18 00	18 37	19 21	03 16	03 52	04 21	04 46
58	18 00	18 39	19 26	03 25	03 59	04 26	04 49
S 60	18 01	18 42	19 33	03 35	04 07	04 32	04 53

Day	SUN Eqn. of Time 00ʰ	SUN Eqn. of Time 12ʰ	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
	m s	m s	h m	h m	h m	d	
22	07 05	07 15	11 53	20 12	07 45	09	
23	07 26	07 36	11 52	21 05	08 39	10	◐
24	07 47	07 57	11 52	21 56	09 31	11	

	G.M.T.	ARIES	VENUS −3.4		MARS +0.8		JUPITER −1.9		SATURN +0.8	
		G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
	d h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
	25 00	3 41.9	208 30.4	N11 20.9	258 16.6	N23 11.2	268 32.2	N22 58.4	215 25.4	N14 00.2
	01	18 44.4	223 30.0	19.9	273 17.5	11.1	283 34.4	58.4	230 27.6	00.1
	02	33 46.8	238 29.5	18.9	288 18.5	11.1	298 36.6	58.4	245 29.8	14 00.0
	03	48 49.3	253 29.1	·· 17.9	303 19.4	·· 11.0	313 38.8	·· 58.4	260 32.0	13 59.9
	04	63 51.8	268 28.6	16.8	318 20.4	10.9	328 41.1	58.4	275 34.2	59.8
	05	78 54.2	283 28.1	15.8	333 21.3	10.8	343 43.3	58.4	290 36.4	59.7
	06	93 56.7	298 27.7	N11 14.8	348 22.3	N23 10.7	358 45.5	N22 58.4	305 38.6	N13 59.7
	07	108 59.2	313 27.2	13.8	3 23.2	10.6	13 47.7	58.4	320 40.8	59.6
	08	124 01.6	328 26.7	12.8	18 24.2	10.5	28 49.9	58.4	335 43.0	59.5
S	09	139 04.1	343 26.3	·· 11.8	33 25.2	·· 10.4	43 52.2	·· 58.4	350 45.2	·· 59.4
U	10	154 06.6	358 25.8	10.7	48 26.1	10.3	58 54.4	58.4	5 47.3	59.3
N	11	169 09.0	13 25.3	09.7	63 27.1	10.2	73 56.6	58.4	20 49.5	59.2
D	12	184 11.5	28 24.9	N11 08.7	78 28.0	N23 10.1	88 58.8	N22 58.4	35 51.7	N13 59.1
A	13	199 13.9	43 24.4	07.7	93 29.0	10.0	104 01.0	58.4	50 53.9	59.0
Y	14	214 16.4	58 24.0	06.7	108 29.9	09.9	119 03.3	58.4	65 56.1	58.9
	15	229 18.9	73 23.5	·· 05.6	123 30.9	·· 09.8	134 05.5	·· 58.3	80 58.3	·· 58.9
	16	244 21.3	88 23.0	04.6	138 31.8	09.7	149 07.7	58.3	96 00.5	58.8
	17	259 23.8	103 22.6	03.6	153 32.8	09.6	164 09.9	58.3	111 02.7	58.7
	18	274 26.3	118 22.1	N11 02.6	168 33.8	N23 09.5	179 12.1	N22 58.3	126 04.9	N13 58.6
	19	289 28.7	133 21.7	01.5	183 34.7	09.4	194 14.4	58.3	141 07.1	58.5
	20	304 31.2	148 21.2	11 00.5	198 35.7	09.3	209 16.6	58.3	156 09.3	58.4
	21	319 33.7	163 20.7	10 59.5	213 36.6	·· 09.2	224 18.8	·· 58.3	171 11.5	·· 58.3
	22	334 36.1	178 20.3	58.5	228 37.6	09.1	239 21.0	58.3	186 13.7	58.2
	23	349 38.6	193 19.8	57.4	243 38.6	09.0	254 23.2	58.3	201 15.9	58.2
	26 00	4 41.1	208 19.4	N10 56.4	258 39.5	N23 08.9	269 25.5	N22 58.3	216 18.0	N13 58.1
	01	19 43.5	223 18.9	55.4	273 40.5	08.8	284 27.7	58.3	231 20.2	58.0
	02	34 46.0	238 18.4	54.4	288 41.4	08.7	299 29.9	58.3	246 22.4	57.9
	03	49 48.4	253 18.0	·· 53.3	303 42.4	·· 08.6	314 32.1	·· 58.3	261 24.6	·· 57.8
	04	64 50.9	268 17.5	52.3	318 43.4	08.5	329 34.4	58.3	276 26.8	57.7
	05	79 53.4	283 17.1	51.3	333 44.3	08.4	344 36.6	58.3	291 29.0	57.6
	06	94 55.8	298 16.6	N10 50.3	348 45.3	N23 08.3	359 38.8	N22 58.2	306 31.2	N13 57.5
	07	109 58.3	313 16.1	49.2	3 46.2	08.2	14 41.0	58.2	321 33.4	57.4
	08	125 00.8	328 15.7	48.2	18 47.2	08.1	29 43.3	58.2	336 35.6	57.4
M	09	140 03.2	343 15.2	·· 47.2	33 48.2	·· 08.0	44 45.5	·· 58.2	351 37.8	·· 57.3
O	10	155 05.7	358 14.8	46.1	48 49.1	07.9	59 47.7	58.2	6 40.0	57.2
N	11	170 08.2	13 14.3	45.1	63 50.1	07.8	74 49.9	58.2	21 42.2	57.1
D	12	185 10.6	28 13.9	N10 44.1	78 51.1	N23 07.7	89 52.2	N22 58.2	36 44.4	N13 57.0
A	13	200 13.1	43 13.4	43.0	93 52.0	07.6	104 54.4	58.2	51 46.6	56.9
Y	14	215 15.6	58 13.0	42.0	108 53.0	07.5	119 56.6	58.2	66 48.8	56.8
	15	230 18.0	73 12.5	·· 41.0	123 54.0	·· 07.4	134 58.9	·· 58.2	81 51.0	·· 56.7
	16	245 20.5	88 12.0	39.9	138 54.9	07.3	150 01.1	58.2	96 53.1	56.7
	17	260 22.9	103 11.6	38.9	153 55.9	07.2	165 03.3	58.2	111 55.3	56.6
	18	275 25.4	118 11.1	N10 37.9	168 56.9	N23 07.1	180 05.5	N22 58.2	126 57.5	N13 56.5
	19	290 27.9	133 10.7	36.8	183 57.8	07.0	195 07.8	58.2	141 59.7	56.4
	20	305 30.3	148 10.2	35.8	198 58.8	06.9	210 10.0	58.2	157 01.9	56.3
	21	320 32.8	163 09.8	·· 34.7	213 59.8	·· 06.8	225 12.2	·· 58.2	172 04.1	·· 56.2
	22	335 35.3	178 09.3	33.7	229 00.7	06.7	240 14.5	58.1	187 06.3	56.1
	23	350 37.7	193 08.9	32.7	244 01.7	06.6	255 16.7	58.1	202 08.5	56.0
	27 00	5 40.2	208 08.4	N10 31.6	259 02.7	N23 06.5	270 18.9	N22 58.1	217 10.7	N13 56.0
	01	20 42.7	223 08.0	30.6	274 03.6	06.4	285 21.2	58.1	232 12.9	55.9
	02	35 45.1	238 07.5	29.5	289 04.6	06.3	300 23.4	58.1	247 15.1	55.8
	03	50 47.6	253 07.1	·· 28.5	304 05.6	·· 06.2	315 25.6	·· 58.1	262 17.3	·· 55.7
	04	65 50.1	268 06.6	27.5	319 06.6	06.1	330 27.9	58.1	277 19.5	55.6
	05	80 52.5	283 06.1	26.4	334 07.5	06.0	345 30.1	58.1	292 21.7	55.5
	06	95 55.0	298 05.7	N10 25.4	349 08.5	N23 05.9	0 32.3	N22 58.1	307 23.9	N13 55.4
	07	110 57.4	313 05.2	24.3	4 09.5	05.8	15 34.6	58.1	322 26.1	55.3
T	08	125 59.9	328 04.8	23.3	19 10.4	05.7	30 36.8	58.1	337 28.3	55.3
U	09	141 02.4	343 04.3	·· 22.2	34 11.4	·· 05.6	45 39.0	·· 58.1	352 30.5	·· 55.2
E	10	156 04.8	358 03.9	21.2	49 12.4	05.5	60 41.3	58.1	7 32.7	55.1
S	11	171 07.3	13 03.4	20.2	64 13.4	05.4	75 43.5	58.1	22 34.9	55.0
D	12	186 09.8	28 03.0	N10 19.1	79 14.3	N23 05.3	90 45.7	N22 58.1	37 37.1	N13 54.9
A	13	201 12.2	43 02.5	18.1	94 15.3	05.2	105 48.0	58.1	52 39.3	54.8
Y	14	216 14.7	58 02.1	17.0	109 16.3	05.1	120 50.2	58.0	67 41.5	54.7
	15	231 17.2	73 01.6	·· 16.0	124 17.3	·· 05.0	135 52.4	·· 58.0	82 43.7	·· 54.6
	16	246 19.6	88 01.2	14.9	139 18.2	04.9	150 54.7	58.0	97 45.8	54.6
	17	261 22.1	103 00.7	13.9	154 19.2	04.7	165 56.9	58.0	112 48.0	54.5
	18	276 24.5	118 00.3	N10 12.8	169 20.2	N23 04.6	180 59.1	N22 58.0	127 50.2	N13 54.4
	19	291 27.0	132 59.8	11.8	184 21.2	04.5	196 01.4	58.0	142 52.4	54.3
	20	306 29.5	147 59.4	10.7	199 22.1	04.4	211 03.6	58.0	157 54.6	54.2
	21	321 31.9	162 59.0	·· 09.7	214 23.1	·· 04.3	226 05.8	·· 58.0	172 56.8	·· 54.1
	22	336 34.4	177 58.5	08.6	229 24.1	04.2	241 08.1	58.0	187 59.0	54.0
	23	351 36.9	192 58.1	07.6	244 25.1	04.1	256 10.3	58.0	203 01.2	53.9
	Mer. Pass.	h m 23 37.4	v −0.5	d 1.0	v 1.0	d 0.1	v 2.2	d 0.0	v 2.2	d 0.1

STARS		
Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 38.5	S40 23.4
Achernar	335 46.3	S57 20.8
Acrux	173 40.0	S62 58.5
Adhara	255 33.7	S28 56.3
Aldebaran	291 20.2	N16 27.9
Alioth	166 44.9	N56 04.9
Alkaid	153 20.6	N49 25.7
Al Na'ir	28 17.1	S47 04.1
Alnilam	276 13.6	S 1 12.9
Alphard	218 22.8	S 8 33.6
Alphecca	126 34.1	N26 47.7
Alpheratz	358 11.0	N28 58.2
Altair	62 34.4	N 8 48.8
Ankaa	353 41.8	S42 25.5
Antares	112 59.5	S26 22.9
Arcturus	146 20.6	N19 18.1
Atria	108 25.6	S68 59.4
Avior	234 29.3	S59 26.1
Bellatrix	279 00.8	N 6 19.8
Betelgeuse	271 30.4	N 7 24.2
Canopus	264 08.1	S52 40.8
Capella	281 14.1	N45 58.4
Deneb	49 49.5	N45 12.4
Denebola	183 01.4	N14 41.9
Diphda	349 22.6	S18 06.4
Dubhe	194 25.3	N61 52.2
Elnath	278 46.6	N28 35.2
Eltanin	90 58.7	N51 29.9
Enif	34 13.3	N 9 46.6
Fomalhaut	15 53.3	S29 44.3
Gacrux	172 31.5	S56 59.3
Gienah	176 20.3	S17 25.0
Hadar	149 26.7	S60 16.0
Hamal	328 30.9	N23 21.5
Kaus Aust.	84 19.5	S34 23.7
Kochab	137 20.0	N74 15.1
Markab	14 04.8	N15 05.3
Menkar	314 43.0	N 4 00.2
Menkent	148 39.7	S36 15.6
Miaplacidus	221 45.9	S69 37.4
Mirfak	309 18.6	N49 46.8
Nunki	76 31.6	S26 19.4
Peacock	54 01.3	S56 48.5
Pollux	244 00.8	N28 04.7
Procyon	245 28.0	N 5 17.0
Rasalhague	96 31.5	N12 34.8
Regulus	208 12.4	N12 04.6
Rigel	281 37.9	S 8 13.5
Rigil Kent.	140 29.0	S60 44.6
Sabik	102 43.5	S15 41.7
Schedar	350 10.6	N56 25.0
Shaula	96 58.6	S37 05.3
Sirius	258 57.5	S16 41.0
Spica	159 00.0	S11 02.6
Suhail	223 12.5	S43 20.4
Vega	80 57.1	N38 46.2
Zuben'ubi	137 35.5	S15 56.9

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	203 38.3	10 07
Mars	253 58.5	6 45
Jupiter	264 44.4	6 01
Saturn	211 37.0	9 33

	G.M.T.	SUN G.H.A.	SUN Dec.	MOON G.H.A.	MOON v	MOON Dec.	MOON d	MOON H.P.
	d h	° ′	° ′	° ′	′	° ′	′	′
	25 00	182 02.0	S 0 43.3	29 56.4	11.0	S 7 03.7	9.9	57.7
	01	197 02.3	44.3	44 26.4	11.0	6 53.8	9.9	57.7
	02	212 02.5	45.3	58 56.4	11.0	6 43.9	10.0	57.7
	03	227 02.7	·· 46.3	73 26.4	11.1	6 33.9	10.0	57.7
	04	242 02.9	47.2	87 56.5	11.1	6 23.9	10.0	57.6
	05	257 03.1	48.2	102 26.6	11.2	6 13.9	10.1	57.6
	06	272 03.3	S 0 49.2	116 56.8	11.1	S 6 03.8	10.1	57.6
	07	287 03.6	50.1	131 26.9	11.3	5 53.7	10.1	57.6
	08	302 03.8	51.1	145 57.2	11.3	5 43.6	10.1	57.6
S	09	317 04.0	·· 52.1	160 27.5	11.3	5 33.5	10.2	57.5
U	10	332 04.2	53.1	174 57.8	11.3	5 23.3	10.2	57.5
N	11	347 04.4	54.0	189 28.1	11.4	5 13.1	10.1	57.5
D	12	2 04.6	S 0 55.0	203 58.5	11.4	S 5 03.0	10.3	57.5
A	13	17 04.9	56.0	218 28.9	11.5	4 52.7	10.2	57.5
Y	14	32 05.1	57.0	232 59.4	11.5	4 42.5	10.2	57.4
	15	47 05.3	·· 57.9	247 29.9	11.6	4 32.3	10.3	57.4
	16	62 05.5	58.9	262 00.5	11.5	4 22.0	10.3	57.4
	17	77 05.7	0 59.9	276 31.0	11.6	4 11.7	10.3	57.4
	18	92 05.9	S 1 00.9	291 01.6	11.7	S 4 01.4	10.3	57.3
	19	107 06.2	01.8	305 32.3	11.7	3 51.1	10.3	57.3
	20	122 06.4	02.8	320 03.0	11.7	3 40.8	10.4	57.3
	21	137 06.6	·· 03.8	334 33.7	11.7	3 30.4	10.3	57.3
	22	152 06.8	04.8	349 04.4	11.8	3 20.1	10.3	57.3
	23	167 07.0	05.7	3 35.2	11.8	3 09.8	10.4	57.2
	26 00	182 07.2	S 1 06.7	18 06.0	11.9	S 2 59.4	10.4	57.2
	01	197 07.4	07.7	32 36.9	11.9	2 49.0	10.4	57.2
	02	212 07.7	08.7	47 07.8	11.9	2 38.6	10.3	57.2
	03	227 07.9	·· 09.6	61 38.7	11.9	2 28.3	10.4	57.2
	04	242 08.1	10.6	76 09.6	12.0	2 17.9	10.4	57.1
	05	257 08.3	11.6	90 40.6	12.0	2 07.5	10.4	57.1
	06	272 08.5	S 1 12.5	105 11.6	12.0	S 1 57.1	10.4	57.1
	07	287 08.7	13.5	119 42.6	12.1	1 46.7	10.4	57.1
	08	302 08.9	14.5	134 13.7	12.1	1 36.3	10.4	57.0
M	09	317 09.2	·· 15.5	148 44.8	12.1	1 25.9	10.4	57.0
O	10	332 09.4	16.4	163 15.9	12.1	1 15.5	10.4	57.0
N	11	347 09.6	17.4	177 47.0	12.2	1 05.1	10.4	57.0
D	12	2 09.8	S 1 18.4	192 18.2	12.2	S 0 54.7	10.4	57.0
A	13	17 10.0	19.4	206 49.4	12.2	0 44.3	10.4	56.9
Y	14	32 10.2	20.3	221 20.6	12.3	0 33.9	10.4	56.9
	15	47 10.4	·· 21.3	235 51.9	12.3	0 23.5	10.3	56.9
	16	62 10.7	22.3	250 23.2	12.3	0 13.2	10.4	56.9
	17	77 10.9	23.3	264 54.5	12.3	S 0 02.8	10.4	56.8
	18	92 11.1	S 1 24.2	279 25.8	12.3	N 0 07.6	10.3	56.8
	19	107 11.3	25.2	293 57.1	12.4	0 17.9	10.3	56.8
	20	122 11.5	26.2	308 28.5	12.4	0 28.2	10.4	56.8
	21	137 11.7	·· 27.2	322 59.9	12.4	0 38.6	10.3	56.8
	22	152 11.9	28.1	337 31.3	12.4	0 48.9	10.3	56.7
	23	167 12.2	29.1	352 02.7	12.5	0 59.2	10.3	56.7
	27 00	182 12.4	S 1 30.1	6 34.2	12.5	N 1 09.5	10.3	56.7
	01	197 12.6	31.1	21 05.7	12.5	1 19.8	10.2	56.7
	02	212 12.8	32.0	35 37.2	12.5	1 30.0	10.3	56.6
	03	227 13.0	·· 33.0	50 08.7	12.5	1 40.3	10.2	56.6
	04	242 13.2	34.0	64 40.2	12.6	1 50.5	10.2	56.6
	05	257 13.4	34.9	79 11.8	12.6	2 00.7	10.2	56.6
	06	272 13.7	S 1 35.9	93 43.4	12.5	N 2 10.9	10.2	56.5
	07	287 13.9	36.9	108 14.9	12.7	2 21.1	10.2	56.5
	08	302 14.1	37.9	122 46.6	12.6	2 31.3	10.1	56.5
T	09	317 14.3	·· 38.8	137 18.2	12.6	2 41.4	10.1	56.5
U	10	332 14.5	39.8	151 49.8	12.7	2 51.5	10.1	56.5
E	11	347 14.7	40.8	166 21.5	12.7	3 01.6	10.1	56.4
S	12	2 14.9	S 1 41.8	180 53.2	12.6	N 3 11.7	10.1	56.4
D	13	17 15.1	42.7	195 24.8	12.8	3 21.8	10.0	56.4
A	14	32 15.4	43.7	209 56.6	12.7	3 31.8	10.0	56.4
Y	15	47 15.6	·· 44.7	224 28.3	12.7	3 41.8	10.0	56.3
	16	62 15.8	45.7	239 00.0	12.7	3 51.8	9.9	56.3
	17	77 16.0	46.6	253 31.7	12.8	4 01.7	9.9	56.3
	18	92 16.2	S 1 47.6	268 03.5	12.8	N 4 11.6	9.9	56.3
	19	107 16.4	48.6	282 35.3	12.8	4 21.5	9.9	56.3
	20	122 16.6	49.5	297 07.1	12.8	4 31.4	9.8	56.2
	21	137 16.8	·· 50.5	311 38.9	12.8	4 41.2	9.8	56.2
	22	152 17.0	51.5	326 10.7	12.8	4 51.0	9.8	56.2
	23	167 17.3	52.5	340 42.5	12.8	5 00.8	9.7	56.2
		S.D. 16.0	*d* 1.0	S.D. 15.7		15.5		15.4

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 25	Moonrise 26	Moonrise 27	Moonrise 28
°	h m	h m	h m	h m	h m	h m	h m
N 72	03 21	04 48	05 56	17 28	17 22	17 17	17 12
N 70	03 37	04 54	05 55	17 22	17 22	17 23	17 23
68	03 50	04 59	05 54	17 17	17 22	17 27	17 33
66	04 01	05 03	05 54	17 13	17 22	17 31	17 40
64	04 09	05 06	05 54	17 10	17 22	17 34	17 47
62	04 16	05 09	05 53	17 07	17 22	17 37	17 52
60	04 22	05 12	05 53	17 04	17 22	17 39	17 57
N 58	04 27	05 14	05 53	17 02	17 22	17 41	18 02
56	04 32	05 16	05 53	17 00	17 22	17 43	18 06
54	04 36	05 17	05 52	16 58	17 22	17 45	18 09
52	04 39	05 19	05 52	16 56	17 22	17 47	18 12
50	04 42	05 20	05 52	16 55	17 22	17 48	18 15
45	04 48	05 22	05 52	16 51	17 22	17 51	18 22
N 40	04 53	05 24	05 51	16 48	17 22	17 54	18 27
35	04 56	05 26	05 51	16 46	17 22	17 56	18 31
30	04 59	05 27	05 50	16 44	17 22	17 59	18 36
20	05 02	05 28	05 50	16 40	17 22	18 02	18 43
N 10	05 04	05 28	05 49	16 37	17 22	18 05	18 49
0	05 03	05 27	05 48	16 34	17 22	18 08	18 55
S 10	05 02	05 26	05 47	16 30	17 22	18 12	19 01
20	04 59	05 24	05 46	16 27	17 22	18 15	19 07
30	04 53	05 21	05 45	16 23	17 22	18 19	19 15
35	04 49	05 19	05 44	16 21	17 22	18 21	19 19
40	04 44	05 16	05 43	16 19	17 22	18 23	19 24
45	04 38	05 13	05 42	16 16	17 22	18 26	19 29
S 50	04 30	05 08	05 41	16 12	17 22	18 30	19 36
52	04 26	05 06	05 40	16 11	17 22	18 32	19 39
54	04 22	05 04	05 39	16 09	17 22	18 33	19 43
56	04 17	05 01	05 38	16 07	17 22	18 35	19 47
58	04 11	04 58	05 37	16 05	17 22	18 37	19 51
S 60	04 04	04 55	05 36	16 03	17 22	18 40	19 56

Lat.	Sunset	Twilight Civil	Twilight Naut.	Moonset 25	Moonset 26	Moonset 27	Moonset 28
°	h m	h m	h m	h m	h m	h m	h m
N 72	17 45	18 52	20 17	02 40	04 27	06 11	07 54
N 70	17 46	18 46	20 02	02 50	04 31	06 08	07 44
68	17 46	18 42	19 49	02 58	04 33	06 06	07 36
66	17 47	18 38	19 40	03 05	04 36	06 04	07 30
64	17 47	18 35	19 31	03 11	04 37	06 02	07 25
62	17 48	18 32	19 25	03 16	04 39	06 01	07 20
60	17 48	18 30	19 19	03 20	04 41	05 59	07 16
N 58	17 49	18 28	19 14	03 24	04 42	05 58	07 13
56	17 49	18 26	19 10	03 27	04 43	05 57	07 09
54	17 49	18 24	19 06	03 30	04 44	05 56	07 07
52	17 50	18 23	19 03	03 33	04 45	05 55	07 04
50	17 50	18 22	19 00	03 36	04 46	05 55	07 02
45	17 50	18 20	18 54	03 41	04 48	05 53	06 57
N 40	17 51	18 18	18 49	03 45	04 49	05 51	06 53
35	17 51	18 17	18 46	03 49	04 50	05 50	06 49
30	17 52	18 16	18 43	03 52	04 51	05 49	06 46
20	17 53	18 15	18 40	03 58	04 53	05 47	06 40
N 10	17 54	18 15	18 39	04 03	04 55	05 46	06 35
0	17 55	18 15	18 39	04 08	04 57	05 44	06 31
S 10	17 56	18 17	18 41	04 13	04 58	05 43	06 26
20	17 57	18 19	18 45	04 18	05 00	05 41	06 21
30	17 58	18 22	18 50	04 23	05 02	05 39	06 16
35	17 59	18 25	18 54	04 26	05 03	05 38	06 13
40	18 00	18 27	18 59	04 30	05 04	05 37	06 09
45	18 02	18 31	19 06	04 34	05 05	05 35	06 05
S 50	18 03	18 36	19 14	04 39	05 07	05 33	06 00
52	18 04	18 38	19 18	04 41	05 07	05 33	05 58
54	18 05	18 40	19 23	04 44	05 08	05 32	05 55
56	18 06	18 43	19 28	04 46	05 09	05 31	05 53
58	18 07	18 46	19 34	04 49	05 10	05 30	05 50
S 60	18 08	18 50	19 41	04 53	05 11	05 29	05 46

Day	SUN Eqn. of Time 00ʰ	SUN Eqn. of Time 12ʰ	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
	m s	m s	h m	h m	h m	d	
25	08 08	08 18	11 52	22 45	10 21	12	○
26	08 28	08 39	11 51	23 33	11 09	13	
27	08 49	08 59	11 51	24 20	11 56	14	

1977 SEPTEMBER 28, 29, 30 (WED., THURS., FRI.)

G.M.T.		ARIES	VENUS −3.4		MARS +0.8		JUPITER −1.9		SATURN +0.8	
		G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
d	h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
28	00	6 39.3	207 57.6	N10 06.5	259 26.1	N23 04.0	271 12.6	N22 58.0	218 03.4	N13 53.9
	01	21 41.8	222 57.2	05.5	274 27.0	03.9	286 14.8	58.0	233 05.6	53.8
	02	36 44.3	237 56.7	04.4	289 28.0	03.8	301 17.0	58.0	248 07.8	53.7
	03	51 46.7	252 56.3	·· 03.4	304 29.0	·· 03.7	316 19.3	·· 58.0	263 10.0	·· 53.6
	04	66 49.2	267 55.8	02.3	319 30.0	03.6	331 21.5	58.0	278 12.2	53.5
	05	81 51.7	282 55.4	01.2	334 31.0	03.5	346 23.8	58.0	293 14.4	53.4
	06	96 54.1	297 54.9	N10 00.2	349 31.9	N23 03.4	1 26.0	N22 57.9	308 16.6	N13 53.3
W	07	111 56.6	312 54.5	9 59.1	4 32.9	03.3	16 28.2	57.9	323 18.8	53.2
E	08	126 59.0	327 54.0	58.1	19 33.9	03.1	31 30.5	57.9	338 21.0	53.2
D	09	142 01.5	342 53.6	·· 57.0	34 34.9	·· 03.0	46 32.7	·· 57.9	353 23.2	·· 53.1
N	10	157 04.0	357 53.1	56.0	49 35.9	02.9	61 35.0	57.9	8 25.4	53.0
E	11	172 06.4	12 52.7	54.9	64 36.8	02.8	76 37.2	57.9	23 27.6	52.9
S	12	187 08.9	27 52.3	N 9 53.9	79 37.8	N23 02.7	91 39.4	N22 57.9	38 29.8	N13 52.8
D	13	202 11.4	42 51.8	52.8	94 38.8	02.6	106 41.7	57.9	53 32.0	52.7
A	14	217 13.8	57 51.4	51.7	109 39.8	02.5	121 43.9	57.9	68 34.2	52.6
Y	15	232 16.3	72 50.9	·· 50.7	124 40.8	·· 02.4	136 46.2	·· 57.9	83 36.4	·· 52.6
	16	247 18.8	87 50.5	49.6	139 41.8	02.3	151 48.4	57.9	98 38.6	52.5
	17	262 21.2	102 50.0	48.6	154 42.8	02.2	166 50.7	57.9	113 40.8	52.4
	18	277 23.7	117 49.6	N 9 47.5	169 43.7	N23 02.1	181 52.9	N22 57.9	128 43.0	N13 52.3
	19	292 26.2	132 49.2	46.4	184 44.7	01.9	196 55.2	57.9	143 45.2	52.2
	20	307 28.6	147 48.7	45.4	199 45.7	01.8	211 57.4	57.9	158 47.4	52.1
	21	322 31.1	162 48.3	·· 44.3	214 46.7	·· 01.7	226 59.6	·· 57.9	173 49.6	·· 52.0
	22	337 33.5	177 47.8	43.2	229 47.7	01.6	242 01.9	57.9	188 51.8	51.9
	23	352 36.0	192 47.4	42.2	244 48.7	01.5	257 04.1	57.8	203 54.0	51.9
29	00	7 38.5	207 46.9	N 9 41.1	259 49.7	N23 01.4	272 06.4	N22 57.8	218 56.2	N13 51.8
	01	22 40.9	222 46.5	40.0	274 50.6	01.3	287 08.6	57.8	233 58.4	51.7
	02	37 43.4	237 46.1	39.0	289 51.6	01.2	302 10.9	57.8	249 00.6	51.6
	03	52 45.9	252 45.6	·· 37.9	304 52.6	·· 01.1	317 13.1	·· 57.8	264 02.8	·· 51.5
	04	67 48.3	267 45.2	36.8	319 53.6	01.0	332 15.4	57.8	279 05.0	51.4
	05	82 50.8	282 44.7	35.8	334 54.6	00.8	347 17.6	57.8	294 07.2	51.3
	06	97 53.3	297 44.3	N 9 34.7	349 55.6	N23 00.7	2 19.9	N22 57.8	309 09.4	N13 51.3
	07	112 55.7	312 43.9	33.6	4 56.6	00.6	17 22.1	57.8	324 11.6	51.2
T	08	127 58.2	327 43.4	32.6	19 57.6	00.5	32 24.4	57.8	339 13.8	51.1
H	09	143 00.6	342 43.0	·· 31.5	34 58.6	·· 00.4	47 26.6	·· 57.8	354 16.0	·· 51.0
U	10	158 03.1	357 42.5	30.4	49 59.6	00.3	62 28.9	57.8	9 18.2	50.9
R	11	173 05.6	12 42.1	29.4	65 00.6	00.2	77 31.1	57.8	24 20.4	50.8
S	12	188 08.0	27 41.7	N 9 28.3	80 01.5	N23 00.1	92 33.4	N22 57.8	39 22.6	N13 50.7
D	13	203 10.5	42 41.2	27.2	95 02.5	22 59.9	107 35.6	57.8	54 24.8	50.7
A	14	218 13.0	57 40.8	26.2	110 03.5	59.8	122 37.9	57.8	69 27.0	50.6
Y	15	233 15.4	72 40.3	·· 25.1	125 04.5	·· 59.7	137 40.1	·· 57.8	84 29.2	·· 50.5
	16	248 17.9	87 39.9	24.0	140 05.5	59.6	152 42.4	57.7	99 31.4	50.4
	17	263 20.4	102 39.5	22.9	155 06.5	59.5	167 44.6	57.7	114 33.6	50.3
	18	278 22.8	117 39.0	N 9 21.9	170 07.5	N22 59.4	182 46.9	N22 57.7	129 35.8	N13 50.2
	19	293 25.3	132 38.6	20.8	185 08.5	59.3	197 49.1	57.7	144 38.0	50.1
	20	308 27.8	147 38.2	19.7	200 09.5	59.1	212 51.4	57.7	159 40.2	50.1
	21	323 30.2	162 37.7	·· 18.6	215 10.5	·· 59.0	227 53.6	·· 57.7	174 42.4	·· 50.0
	22	338 32.7	177 37.3	17.6	230 11.5	58.9	242 55.9	57.7	189 44.6	49.9
	23	353 35.1	192 36.9	16.5	245 12.5	58.8	257 58.1	57.7	204 46.8	49.8
30	00	8 37.6	207 36.4	N 9 15.4	260 13.5	N22 58.7	273 00.4	N22 57.7	219 49.0	N13 49.7
	01	23 40.1	222 36.0	14.3	275 14.5	58.6	288 02.6	57.7	234 51.2	49.6
	02	38 42.5	237 35.5	13.3	290 15.5	58.5	303 04.9	57.7	249 53.4	49.5
	03	53 45.0	252 35.1	·· 12.2	305 16.5	·· 58.3	318 07.2	·· 57.7	264 55.6	·· 49.5
	04	68 47.5	267 34.7	11.1	320 17.5	58.2	333 09.4	57.7	279 57.8	49.4
	05	83 49.9	282 34.2	10.0	335 18.5	58.1	348 11.7	57.7	295 00.0	49.3
	06	98 52.4	297 33.8	N 9 08.9	350 19.5	N22 58.0	3 13.9	N22 57.7	310 02.2	N13 49.2
	07	113 54.9	312 33.4	07.9	5 20.5	57.9	18 16.2	57.7	325 04.4	49.1
	08	128 57.3	327 32.9	06.8	20 21.5	57.8	33 18.4	57.7	340 06.6	49.0
F	09	143 59.8	342 32.5	·· 05.7	35 22.5	·· 57.7	48 20.7	·· 57.6	355 08.8	·· 48.9
R	10	159 02.3	357 32.1	04.6	50 23.5	57.5	63 22.9	57.6	10 11.0	48.9
I	11	174 04.7	12 31.6	03.5	65 24.5	57.4	78 25.2	57.6	25 13.2	48.8
D	12	189 07.2	27 31.2	N 9 02.5	80 25.5	N22 57.3	93 27.5	N22 57.6	40 15.4	N13 48.7
A	13	204 09.6	42 30.8	01.4	95 26.5	57.2	108 29.7	57.6	55 17.6	48.6
Y	14	219 12.1	57 30.3	9 00.3	110 27.5	57.1	123 32.0	57.6	70 19.8	48.5
	15	234 14.6	72 29.9	8 59.2	125 28.5	·· 57.0	138 34.2	·· 57.6	85 22.0	·· 48.4
	16	249 17.0	87 29.5	58.1	140 29.5	56.8	153 36.5	57.6	100 24.2	48.3
	17	264 19.5	102 29.0	57.0	155 30.5	56.7	168 38.8	57.6	115 26.4	48.3
	18	279 22.0	117 28.6	N 8 56.0	170 31.5	N22 56.6	183 41.0	N22 57.6	130 28.6	N13 48.2
	19	294 24.4	132 28.2	54.9	185 32.5	56.5	198 43.3	57.6	145 30.8	48.1
	20	309 26.9	147 27.7	53.8	200 33.5	56.4	213 45.5	57.6	160 33.1	48.0
	21	324 29.4	162 27.3	·· 52.7	215 34.5	·· 56.3	228 47.8	·· 57.6	175 35.3	·· 47.9
	22	339 31.8	177 26.9	51.6	230 35.5	56.1	243 50.1	57.6	190 37.5	47.8
	23	354 34.3	192 26.4	50.5	245 36.5	56.0	258 52.3	57.6	205 39.7	47.8
Mer. Pass.		h m 23 25.6	*v* −0.4	*d* 1.1	*v* 1.0	*d* 0.1	*v* 2.3	*d* 0.0	*v* 2.2	*d* 0.1

STARS		
Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 38.5	S40 23.5
Achernar	335 46.3	S57 20.8
Acrux	173 40.0	S62 58.5
Adhara	255 33.7	S28 56.3
Aldebaran	291 20.1	N16 27.9
Alioth	166 44.9	N56 04.9
Alkaid	153 20.6	N49 25.6
Al Na'ir	28 17.1	S47 04.1
Alnilam	276 13.6	S 1 12.9
Alphard	218 22.8	S 8 33.6
Alphecca	126 34.1	N26 47.6
Alpheratz	358 11.0	N28 58.2
Altair	62 34.4	N 8 48.8
Ankaa	353 41.8	S42 25.5
Antares	112 59.5	S26 22.9
Arcturus	146 20.6	N19 18.1
Atria	108 25.7	S68 59.4
Avior	234 29.3	S59 26.1
Bellatrix	279 00.8	N 6 19.8
Betelgeuse	271 30.4	N 7 24.2
Canopus	264 08.1	S52 40.8
Capella	281 14.1	N45 58.4
Deneb	49 49.5	N45 12.4
Denebola	183 01.4	N14 41.9
Diphda	349 22.6	S18 06.4
Dubhe	194 25.3	N61 52.2
Elnath	278 46.6	N28 35.2
Eltanin	90 58.7	N51 29.9
Enif	34 13.3	N 9 46.6
Fomalhaut	15 53.3	S29 44.3
Gacrux	172 31.5	S56 59.3
Gienah	176 20.3	S17 25.0
Hadar	149 26.7	S60 16.0
Hamal	328 30.9	N23 21.5
Kaus Aust.	84 19.5	S34 23.7
Kochab	137 20.0	N74 15.1
Markab	14 04.8	N15 05.3
Menkar	314 43.0	N 4 00.2
Menkent	148 39.7	S36 15.6
Miaplacidus	221 45.8	S69 37.4
Mirfak	309 18.6	N49 46.8
Nunki	76 31.6	S26 19.4
Peacock	54 01.3	S56 48.5
Pollux	244 00.7	N28 04.7
Procyon	245 28.0	N 5 17.0
Rasalhague	96 31.5	N12 34.8
Regulus	208 12.4	N12 04.6
Rigel	281 37.8	S 8 13.5
Rigil Kent.	140 29.0	S60 44.6
Sabik	102 43.5	S15 41.7
Schedar	350 10.6	N56 25.0
Shaula	96 58.6	S37 05.3
Sirius	258 57.5	S16 41.0
Spica	159 00.0	S11 02.6
Suhail	223 12.5	S43 20.4
Vega	80 57.2	N38 46.2
Zuben'ubi	137 35.5	S15 56.9

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	200 08.5	10 09
Mars	252 11.2	6 40
Jupiter	264 27.9	5 51
Saturn	211 17.7	9 23

1977 SEPTEMBER 28, 29, 30 (WED., THURS., FRI.)

G.M.T.		SUN G.H.A.	SUN Dec.	MOON G.H.A.	v	MOON Dec.	d	H.P.
	d h	° ′	° ′	° ′	′	° ′	′	′
	28 00	182 17.5	S 1 53.4	355 14.3	12.8	N 5 10.5	9.7	56.1
	01	197 17.7	54.4	9 46.1	12.9	5 20.2	9.7	56.1
	02	212 17.9	55.4	24 18.0	12.8	5 29.9	9.7	56.1
	03	227 18.1	·· 56.4	38 49.8	12.9	5 39.6	9.6	56.1
	04	242 18.3	57.3	53 21.7	12.9	5 49.2	9.5	56.0
	05	257 18.5	58.3	67 53.6	12.9	5 58.7	9.6	56.0
	06	272 18.7	S 1 59.3	82 25.5	12.8	N 6 08.3	9.5	56.0
W	07	287 18.9	2 00.3	96 57.3	12.9	6 17.8	9.4	56.0
E	08	302 19.2	01.2	111 29.2	12.9	6 27.2	9.4	56.0
D	09	317 19.4	·· 02.2	126 01.1	13.0	6 36.6	9.4	55.9
N	10	332 19.6	03.2	140 33.1	12.9	6 46.0	9.3	55.9
E	11	347 19.8	04.1	155 05.0	12.9	6 55.3	9.3	55.9
S	12	2 20.0	S 2 05.1	169 36.9	12.9	N 7 04.6	9.3	55.9
D	13	17 20.2	06.1	184 08.8	12.9	7 13.9	9.2	55.8
A	14	32 20.4	07.1	198 40.7	13.0	7 23.1	9.2	55.8
Y	15	47 20.6	·· 08.0	213 12.7	12.9	7 32.3	9.1	55.8
	16	62 20.8	09.0	227 44.6	13.0	7 41.4	9.1	55.8
	17	77 21.0	10.0	242 16.6	12.9	7 50.5	9.1	55.8
	18	92 21.3	S 2 11.0	256 48.5	12.9	N 7 59.6	9.0	55.7
	19	107 21.5	11.9	271 20.4	13.0	8 08.6	8.9	55.7
	20	122 21.7	12.9	285 52.4	13.0	8 17.5	8.9	55.7
	21	137 21.9	·· 13.9	300 24.4	12.9	8 26.4	8.9	55.7
	22	152 22.1	14.8	314 56.3	13.0	8 35.3	8.8	55.6
	23	167 22.3	15.8	329 28.3	12.9	8 44.1	8.8	55.6
	29 00	182 22.5	S 2 16.8	344 00.2	13.0	N 8 52.9	8.7	55.6
	01	197 22.7	17.8	358 32.2	12.9	9 01.6	8.6	55.6
	02	212 22.9	18.7	13 04.1	13.0	9 10.2	8.7	55.6
	03	227 23.1	·· 19.7	27 36.1	13.0	9 18.9	8.5	55.5
	04	242 23.3	20.7	42 08.1	12.9	9 27.4	8.5	55.5
	05	257 23.6	21.6	56 40.0	13.0	9 35.9	8.5	55.5
	06	272 23.8	S 2 22.6	71 12.0	13.0	N 9 44.4	8.4	55.5
	07	287 24.0	23.6	85 44.0	12.9	9 52.8	8.4	55.4
T	08	302 24.2	24.6	100 15.9	13.0	10 01.2	8.3	55.4
H	09	317 24.4	·· 25.5	114 47.9	12.9	10 09.5	8.2	55.4
U	10	332 24.6	26.5	129 19.8	13.0	10 17.7	8.2	55.4
R	11	347 24.8	27.5	143 51.8	12.9	10 25.9	8.2	55.4
S	12	2 25.0	S 2 28.5	158 23.7	13.0	N10 34.1	8.1	55.3
D	13	17 25.2	29.4	172 55.7	12.9	10 42.2	8.0	55.3
A	14	32 25.4	30.4	187 27.6	13.0	10 50.2	8.0	55.3
Y	15	47 25.6	·· 31.4	201 59.6	12.9	10 58.2	7.9	55.3
	16	62 25.8	32.3	216 31.5	13.0	11 06.1	7.8	55.3
	17	77 26.0	33.3	231 03.5	12.9	11 13.9	7.8	55.2
	18	92 26.3	S 2 34.3	245 35.4	13.0	N11 21.7	7.8	55.2
	19	107 26.5	35.3	260 07.4	12.9	11 29.5	7.7	55.2
	20	122 26.7	36.2	274 39.3	12.9	11 37.2	7.6	55.2
	21	137 26.9	·· 37.2	289 11.2	12.9	11 44.8	7.6	55.2
	22	152 27.1	38.2	303 43.1	13.0	11 52.4	7.5	55.1
	23	167 27.3	39.1	318 15.1	12.9	11 59.9	7.4	55.1
	30 00	182 27.5	S 2 40.1	332 47.0	12.9	N12 07.3	7.4	55.1
	01	197 27.7	41.1	347 18.9	12.9	12 14.7	7.3	55.1
	02	212 27.9	42.1	1 50.8	12.9	12 22.0	7.3	55.1
	03	227 28.1	·· 43.0	16 22.7	12.9	12 29.3	7.2	55.0
	04	242 28.3	44.0	30 54.6	12.9	12 36.5	7.1	55.0
	05	257 28.5	45.0	45 26.5	12.8	12 43.6	7.0	55.0
	06	272 28.7	S 2 45.9	59 58.3	12.9	N12 50.6	7.1	55.0
	07	287 28.9	46.9	74 30.2	12.9	12 57.7	6.9	55.0
	08	302 29.1	47.9	89 02.1	12.9	13 04.6	6.9	55.0
F	09	317 29.3	·· 48.8	103 34.0	12.8	13 11.5	6.8	54.9
R	10	332 29.6	49.8	118 05.8	12.9	13 18.3	6.7	54.9
I	11	347 29.8	50.8	132 37.7	12.8	13 25.0	6.7	54.9
D	12	2 30.0	S 2 51.8	147 09.5	12.8	N13 31.7	6.6	54.9
A	13	17 30.2	52.7	161 41.3	12.9	13 38.3	6.5	54.9
Y	14	32 30.4	53.7	176 13.2	12.8	13 44.8	6.5	54.9
	15	47 30.6	·· 54.7	190 45.0	12.8	13 51.3	6.4	54.8
	16	62 30.8	55.6	205 16.8	12.8	13 57.7	6.3	54.8
	17	77 31.0	56.6	219 48.6	12.8	14 04.0	6.3	54.8
	18	92 31.2	S 2 57.6	234 20.4	12.8	N14 10.3	6.2	54.8
	19	107 31.4	58.6	248 52.2	12.8	14 16.5	6.1	54.8
	20	122 31.6	2 59.5	263 24.0	12.8	14 22.6	6.1	54.8
	21	137 31.8	3 00.5	277 55.8	12.8	14 28.7	6.0	54.7
	22	152 32.0	01.5	292 27.6	12.8	14 34.7	5.9	54.7
	23	167 32.2	02.4	306 59.4	12.7	14 40.6	5.8	54.7
		S.D. 16.0	*d* 1.0	S.D. 15.2		15.1		15.0

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 28	Moonrise 29	Moonrise 30	Moonrise 1
°	h m	h m	h m	h m	h m	h m	h m
N 72	03 38	05 02	06 09	17 12	17 07	17 01	16 54
N 70	03 52	05 06	06 07	17 23	17 25	17 28	17 35
68	04 02	05 10	06 05	17 33	17 40	17 49	18 04
66	04 11	05 13	06 04	17 40	17 51	18 06	18 25
64	04 18	05 15	06 02	17 47	18 01	18 19	18 42
62	04 25	05 17	06 01	17 52	18 10	18 31	18 56
60	04 30	05 19	06 00	17 57	18 17	18 40	19 08
N 58	04 34	05 20	05 59	18 02	18 24	18 49	19 19
56	04 38	05 22	05 59	18 06	18 30	18 57	19 28
54	04 41	05 23	05 58	18 09	18 35	19 03	19 36
52	04 44	05 24	05 57	18 12	18 39	19 09	19 43
50	04 47	05 24	05 57	18 15	18 44	19 15	19 50
45	04 52	05 26	05 55	18 22	18 53	19 27	20 04
N 40	04 56	05 27	05 54	18 27	19 01	19 37	20 15
35	04 58	05 28	05 53	18 31	19 07	19 45	20 25
30	05 00	05 28	05 52	18 36	19 13	19 53	20 34
20	05 03	05 28	05 50	18 43	19 24	20 06	20 49
N 10	05 03	05 28	05 49	18 49	19 33	20 17	21 02
0	05 02	05 26	05 47	18 55	19 41	20 28	21 14
S 10	05 00	05 24	05 45	19 01	19 50	20 38	21 27
20	04 56	05 21	05 43	19 07	19 59	20 50	21 40
30	04 49	05 17	05 41	19 15	20 09	21 03	21 55
35	04 45	05 14	05 40	19 19	20 16	21 11	22 04
40	04 39	05 11	05 38	19 24	20 23	21 20	22 14
45	04 32	05 07	05 36	19 29	20 31	21 30	22 26
S 50	04 23	05 02	05 34	19 36	20 40	21 42	22 41
52	04 19	04 59	05 33	19 39	20 45	21 48	22 48
54	04 14	04 56	05 32	19 43	20 50	21 55	22 55
56	04 08	04 53	05 30	19 47	20 56	22 02	23 04
58	04 01	04 49	05 29	19 51	21 02	22 10	23 13
S 60	03 54	04 45	05 27	19 56	21 09	22 19	23 24

Lat.	Sunset	Twilight Civil	Twilight Naut.	Moonset 28	Moonset 29	Moonset 30	Moonset 1
°	h m	h m	h m	h m	h m	h m	h m
N 72	17 29	18 36	19 59	07 54	09 35	11 18	13 02
N 70	17 32	18 32	19 46	07 44	09 18	10 51	12 21
68	17 34	18 29	19 35	07 36	09 05	10 31	11 53
66	17 35	18 26	19 27	07 30	08 54	10 16	11 32
64	17 37	18 24	19 20	07 25	08 45	10 03	11 16
62	17 38	18 22	19 14	07 20	08 37	09 52	11 02
60	17 39	18 20	19 09	07 16	08 31	09 43	10 50
N 58	17 40	18 19	19 05	07 13	08 25	09 35	10 40
56	17 41	18 18	19 01	07 09	08 20	09 27	10 32
54	17 42	18 17	18 58	07 07	08 15	09 21	10 24
52	17 43	18 16	18 55	07 04	08 11	09 16	10 17
50	17 43	18 15	18 53	07 02	08 07	09 10	10 11
45	17 45	18 14	18 48	06 57	07 59	08 59	09 57
N 40	17 46	18 13	18 44	06 53	07 52	08 50	09 46
35	17 47	18 12	18 42	06 49	07 46	08 42	09 37
30	17 48	18 12	18 40	06 46	07 41	08 35	09 29
20	17 50	18 12	18 38	06 40	07 32	08 24	09 14
N 10	17 52	18 13	18 37	06 35	07 24	08 13	09 02
0	17 54	18 14	18 38	06 31	07 17	08 04	08 50
S 10	17 55	18 16	18 41	06 26	07 10	07 54	08 39
20	17 58	18 20	18 45	06 21	07 02	07 44	08 26
30	18 00	18 24	18 52	06 16	06 53	07 32	08 12
35	18 02	18 27	18 57	06 13	06 48	07 25	08 04
40	18 03	18 30	19 02	06 09	06 42	07 17	07 54
45	18 05	18 35	19 10	06 05	06 36	07 08	07 44
S 50	18 08	18 40	19 19	06 00	06 28	06 58	07 30
52	18 09	18 43	19 24	05 58	06 24	06 53	07 24
54	18 10	18 46	19 29	05 55	06 20	06 47	07 18
56	18 12	18 49	19 35	05 53	06 16	06 41	07 10
58	18 13	18 53	19 41	05 50	06 11	06 34	07 02
S 60	18 15	18 57	19 49	05 46	06 05	06 27	06 52

Day	SUN Eqn. of Time 00ʰ	SUN Eqn. of Time 12ʰ	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	Age	Phase
	m s	m s	h m	h m	h m	d	
28	09 09	09 20	11 51	00 20	12 43	15	
29	09 30	09 40	11 50	01 06	13 29	16	○
30	09 50	09 59	11 50	01 52	14 16	17	

1977 OCTOBER 1, 2, 3 (SAT., SUN., MON.)

	G.M.T.	ARIES	VENUS −3.4		MARS +0.8		JUPITER −1.9		SATURN +0.8	
		G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
	d h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
	1 00	9 36.7	207 26.0	N 8 49.4	260 37.6	N22 55.9	273 54.6	N22 57.6	220 41.9	N13 47.7
	01	24 39.2	222 25.6	48.4	275 38.6	55.8	288 56.8	57.6	235 44.1	47.6
	02	39 41.7	237 25.1	47.3	290 39.6	55.7	303 59.1	57.6	250 46.3	47.5
	03	54 44.1	252 24.7	·· 46.2	305 40.6	·· 55.5	319 01.4	·· 57.5	265 48.5	·· 47.4
	04	69 46.6	267 24.3	45.1	320 41.6	55.4	334 03.6	57.5	280 50.7	47.3
	05	84 49.1	282 23.9	44.0	335 42.6	55.3	349 05.9	57.5	295 52.9	47.2
	06	99 51.5	297 23.4	N 8 42.9	350 43.6	N22 55.2	4 08.2	N22 57.5	310 55.1	N13 47.2
	07	114 54.0	312 23.0	41.8	5 44.6	55.1	19 10.4	57.5	325 57.3	47.1
S	08	129 56.5	327 22.6	40.7	20 45.6	54.9	34 12.7	57.5	340 59.5	47.0
A	09	144 58.9	342 22.1	·· 39.6	35 46.6	·· 54.8	49 15.0	·· 57.5	356 01.7	·· 46.9
T	10	160 01.4	357 21.7	38.5	50 47.7	54.7	64 17.2	57.5	11 03.9	46.8
U	11	175 03.9	12 21.3	37.5	65 48.7	54.6	79 19.5	57.5	26 06.1	46.7
R	12	190 06.3	27 20.9	N 8 36.4	80 49.7	N22 54.5	94 21.8	N22 57.5	41 08.3	N13 46.6
D	13	205 08.8	42 20.4	35.3	95 50.7	54.4	109 24.0	57.5	56 10.5	46.6
A	14	220 11.2	57 20.0	34.2	110 51.7	54.2	124 26.3	57.5	71 12.7	46.5
Y	15	235 13.7	72 19.6	·· 33.1	125 52.7	·· 54.1	139 28.6	·· 57.5	86 14.9	·· 46.4
	16	250 16.2	87 19.1	32.0	140 53.7	54.0	154 30.8	57.5	101 17.1	46.3
	17	265 18.6	102 18.7	30.9	155 54.7	53.9	169 33.1	57.5	116 19.3	46.2
	18	280 21.1	117 18.3	N 8 29.8	170 55.8	N22 53.7	184 35.4	N22 57.5	131 21.6	N13 46.1
	19	295 23.6	132 17.9	28.7	185 56.8	53.6	199 37.6	57.5	146 23.8	46.1
	20	310 26.0	147 17.4	27.6	200 57.8	53.5	214 39.9	57.5	161 26.0	46.0
	21	325 28.5	162 17.0	·· 26.5	215 58.8	·· 53.4	229 42.2	·· 57.4	176 28.2	·· 45.9
	22	340 31.0	177 16.6	25.4	230 59.8	53.3	244 44.4	57.4	191 30.4	45.8
	23	355 33.4	192 16.2	24.3	246 00.8	53.1	259 46.7	57.4	206 32.6	45.7
	2 00	10 35.9	207 15.7	N 8 23.2	261 01.9	N22 53.0	274 49.0	N22 57.4	221 34.8	N13 45.6
	01	25 38.4	222 15.3	22.1	276 02.9	52.9	289 51.2	57.4	236 37.0	45.6
	02	40 40.8	237 14.9	21.0	291 03.9	52.8	304 53.5	57.4	251 39.2	45.5
	03	55 43.3	252 14.4	·· 19.9	306 04.9	·· 52.7	319 55.8	·· 57.4	266 41.4	·· 45.4
	04	70 45.7	267 14.0	18.8	321 05.9	52.5	334 58.1	57.4	281 43.6	45.3
	05	85 48.2	282 13.6	17.7	336 06.9	52.4	350 00.3	57.4	296 45.8	45.2
	06	100 50.7	297 13.2	N 8 16.6	351 08.0	N22 52.3	5 02.6	N22 57.4	311 48.0	N13 45.1
	07	115 53.1	312 12.7	15.5	6 09.0	52.2	20 04.9	57.4	326 50.2	45.0
	08	130 55.6	327 12.3	14.4	21 10.0	52.0	35 07.1	57.4	341 52.4	45.0
S	09	145 58.1	342 11.9	·· 13.3	36 11.0	·· 51.9	50 09.4	·· 57.4	356 54.6	·· 44.9
U	10	161 00.5	357 11.5	12.2	51 12.1	51.8	65 11.7	57.4	11 56.9	44.8
N	11	176 03.0	12 11.0	11.1	66 13.1	51.7	80 14.0	57.4	26 59.1	44.7
D	12	191 05.5	27 10.6	N 8 10.0	81 14.1	N22 51.5	95 16.2	N22 57.4	42 01.3	N13 44.6
A	13	206 07.9	42 10.2	08.9	96 15.1	51.4	110 18.5	57.4	57 03.5	44.5
Y	14	221 10.4	57 09.8	07.8	111 16.1	51.3	125 20.8	57.4	72 05.7	44.5
	15	236 12.8	72 09.4	·· 06.7	126 17.2	·· 51.2	140 23.1	·· 57.4	87 07.9	·· 44.4
	16	251 15.3	87 08.9	05.6	141 18.2	51.1	155 25.3	57.4	102 10.1	44.3
	17	266 17.8	102 08.5	04.5	156 19.2	50.9	170 27.6	57.3	117 12.3	44.2
	18	281 20.2	117 08.1	N 8 03.4	171 20.2	N22 50.8	185 29.9	N22 57.3	132 14.5	N13 44.1
	19	296 22.7	132 07.7	02.3	186 21.3	50.7	200 32.2	57.3	147 16.7	44.0
	20	311 25.2	147 07.2	01.1	201 22.3	50.6	215 34.4	57.3	162 18.9	44.0
	21	326 27.6	162 06.8	8 00.0	216 23.3	·· 50.4	230 36.7	·· 57.3	177 21.1	·· 43.9
	22	341 30.1	177 06.4	7 58.9	231 24.3	50.3	245 39.0	57.3	192 23.3	43.8
	23	356 32.6	192 06.0	57.8	246 25.4	50.2	260 41.3	57.3	207 25.6	43.7
	3 00	11 35.0	207 05.6	N 7 56.7	261 26.4	N22 50.1	275 43.5	N22 57.3	222 27.8	N13 43.6
	01	26 37.5	222 05.1	55.6	276 27.4	49.9	290 45.8	57.3	237 30.0	43.5
	02	41 40.0	237 04.7	54.5	291 28.5	49.8	305 48.1	57.3	252 32.2	43.5
	03	56 42.4	252 04.3	·· 53.4	306 29.5	·· 49.7	320 50.4	·· 57.3	267 34.4	·· 43.4
	04	71 44.9	267 03.9	52.3	321 30.5	49.6	335 52.7	57.3	282 36.6	43.3
	05	86 47.3	282 03.4	51.2	336 31.5	49.4	350 54.9	57.3	297 38.8	43.2
	06	101 49.8	297 03.0	N 7 50.1	351 32.6	N22 49.3	5 57.2	N22 57.3	312 41.0	N13 43.1
	07	116 52.3	312 02.6	48.9	6 33.6	49.2	20 59.5	57.3	327 43.2	43.0
	08	131 54.7	327 02.2	47.8	21 34.6	49.1	36 01.8	57.3	342 45.4	43.0
M	09	146 57.2	342 01.8	·· 46.7	36 35.7	·· 48.9	51 04.1	·· 57.3	357 47.6	·· 42.9
O	10	161 59.7	357 01.3	45.6	51 36.7	48.8	66 06.3	57.3	12 49.8	42.8
N	11	177 02.1	12 00.9	44.5	66 37.7	48.7	81 08.6	57.3	27 52.1	42.7
D	12	192 04.6	27 00.5	N 7 43.4	81 38.8	N22 48.5	96 10.9	N22 57.3	42 54.3	N13 42.6
A	13	207 07.1	42 00.1	42.3	96 39.8	48.4	111 13.2	57.2	57 56.5	42.5
Y	14	222 09.5	56 59.7	41.1	111 40.8	48.3	126 15.5	57.2	72 58.7	42.5
	15	237 12.0	71 59.3	·· 40.0	126 41.9	·· 48.2	141 17.8	·· 57.2	88 00.9	·· 42.4
	16	252 14.5	86 58.8	38.9	141 42.9	48.0	156 20.0	57.2	103 03.1	42.3
	17	267 16.9	101 58.4	37.8	156 43.9	47.9	171 22.3	57.2	118 05.3	42.2
	18	282 19.4	116 58.0	N 7 36.7	171 45.0	N22 47.8	186 24.6	N22 57.2	133 07.5	N13 42.1
	19	297 21.8	131 57.6	35.6	186 46.0	47.7	201 26.9	57.2	148 09.7	42.0
	20	312 24.3	146 57.2	34.4	201 47.0	47.5	216 29.2	57.2	163 11.9	42.0
	21	327 26.8	161 56.7	·· 33.3	216 48.1	·· 47.4	231 31.5	·· 57.2	178 14.2	·· 41.9
	22	342 29.2	176 56.3	32.2	231 49.1	47.3	246 33.7	57.2	193 16.4	41.8
	23	357 31.7	191 55.9	31.1	246 50.1	47.1	261 36.0	57.2	208 18.6	41.7
	Mer. Pass.	h m 23 13.8	v −0.4	d 1.1	v 1.0	d 0.1	v 2.3	d 0.0	v 2.2	d 0.1

STARS

Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 38.4	S40 23.5
Achernar	335 46.3	S57 20.9
Acrux	173 40.0	S62 58.5
Adhara	255 33.7	S28 56.3
Aldebaran	291 20.1	N16 27.9
Alioth	166 44.9	N56 04.9
Alkaid	153 20.6	N49 25.6
Al Na'ir	28 17.1	S47 04.1
Alnilam	276 13.6	S 1 12.9
Alphard	218 22.7	S 8 33.6
Alphecca	126 34.1	N26 47.6
Alpheratz	358 11.0	N28 58.2
Altair	62 34.4	N 8 48.8
Ankaa	353 41.8	S42 25.5
Antares	112 59.5	S26 22.9
Arcturus	146 20.6	N19 18.1
Atria	108 25.7	S68 59.4
Avior	234 29.2	S59 26.1
Bellatrix	279 00.8	N 6 19.8
Betelgeuse	271 30.4	N 7 24.2
Canopus	264 08.0	S52 40.8
Capella	281 14.1	N45 58.4
Deneb	49 49.6	N45 12.4
Denebola	183 01.4	N14 41.9
Diphda	349 22.6	S18 06.4
Dubhe	194 25.3	N61 52.2
Elnath	278 46.5	N28 35.2
Eltanin	90 58.8	N51 29.9
Enif	34 13.3	N 9 46.6
Fomalhaut	15 53.3	S29 44.3
Gacrux	172 31.5	S56 59.2
Gienah	176 20.3	S17 25.0
Hadar	149 26.7	S60 16.0
Hamal	328 30.8	N23 21.5
Kaus Aust.	84 19.5	S34 23.7
Kochab	137 20.0	N74 15.1
Markab	14 04.8	N15 05.3
Menkar	314 43.0	N 4 00.2
Menkent	148 39.7	S36 15.6
Miaplacidus	221 45.8	S69 37.4
Mirfak	309 18.6	N49 46.8
Nunki	76 31.6	S26 19.4
Peacock	54 01.3	S56 48.5
Pollux	244 00.7	N28 04.7
Procyon	245 28.0	N 5 16.9
Rasalhague	96 31.5	N12 34.8
Regulus	208 12.4	N12 04.6
Rigel	281 37.8	S 8 13.5
Rigil Kent.	140 29.0	S60 44.6
Sabik	102 43.6	S15 41.7
Schedar	350 10.6	N56 25.0
Shaula	96 58.6	S37 05.3
Sirius	258 57.5	S16 41.0
Spica	159 00.0	S11 02.6
Suhail	223 12.5	S43 20.4
Vega	80 57.2	N38 46.2
Zuben'ubi	137 35.5	S15 56.8

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	196 39.8	10 11
Mars	250 26.0	6 35
Jupiter	264 13.1	5 40
Saturn	210 58.9	9 12

1977 OCTOBER 1, 2, 3 (SAT., SUN., MON.)

	G.M.T.	SUN G.H.A.	SUN Dec.	MOON G.H.A.	MOON v	MOON Dec.	MOON d	MOON H.P.
	d h	° ′	° ′	° ′	′	° ′	′	′
	1 00	182 32.4	S 3 03.4	321 31.1	12.8	N14 46.4	5.8	54.7
	01	197 32.6	04.4	336 02.9	12.7	14 52.2	5.7	54.7
	02	212 32.8	05.3	350 34.6	12.8	14 57.9	5.7	54.7
	03	227 33.0	·· 06.3	5 06.4	12.7	15 03.6	5.5	54.6
	04	242 33.2	07.3	19 38.1	12.7	15 09.1	5.5	54.6
	05	257 33.4	08.3	34 09.8	12.7	15 14.6	5.4	54.6
	06	272 33.6	S 3 09.2	48 41.5	12.7	N15 20.0	5.4	54.6
	07	287 33.8	10.2	63 13.2	12.7	15 25.4	5.2	54.6
S	08	302 34.0	11.2	77 44.9	12.7	15 30.6	5.2	54.6
A	09	317 34.2	·· 12.1	92 16.6	12.7	15 35.8	5.1	54.6
T	10	332 34.4	13.1	106 48.3	12.7	15 40.9	5.1	54.5
U	11	347 34.6	14.1	121 20.0	12.6	15 46.0	4.9	54.5
R	12	2 34.8	S 3 15.0	135 51.6	12.7	N15 50.9	4.9	54.5
D	13	17 35.0	16.0	150 23.3	12.6	15 55.8	4.8	54.5
A	14	32 35.2	17.0	164 54.9	12.7	16 00.6	4.8	54.5
Y	15	47 35.4	·· 18.0	179 26.6	12.6	16 05.4	4.7	54.5
	16	62 35.6	18.9	193 58.2	12.6	16 10.1	4.5	54.5
	17	77 35.8	19.9	208 29.8	12.7	16 14.6	4.6	54.5
	18	92 36.1	S 3 20.9	223 01.5	12.6	N16 19.2	4.4	54.4
	19	107 36.3	21.8	237 33.1	12.6	16 23.6	4.3	54.4
	20	122 36.5	22.8	252 04.7	12.6	16 27.9	4.3	54.4
	21	137 36.7	·· 23.8	266 36.3	12.6	16 32.2	4.2	54.4
	22	152 36.9	24.7	281 07.9	12.5	16 36.4	4.2	54.4
	23	167 37.1	25.7	295 39.4	12.6	16 40.6	4.0	54.4
	2 00	182 37.3	S 3 26.7	310 11.0	12.6	N16 44.6	4.0	54.4
	01	197 37.5	27.6	324 42.6	12.5	16 48.6	3.9	54.4
	02	212 37.7	28.6	339 14.1	12.6	16 52.5	3.8	54.4
	03	227 37.9	·· 29.6	353 45.7	12.5	16 56.3	3.7	54.4
	04	242 38.1	30.5	8 17.2	12.6	17 00.0	3.6	54.3
	05	257 38.3	31.5	22 48.8	12.5	17 03.6	3.6	54.3
	06	272 38.5	S 3 32.5	37 20.3	12.5	N17 07.2	3.5	54.3
	07	287 38.7	33.4	51 51.8	12.5	17 10.7	3.4	54.3
	08	302 38.8	34.4	66 23.3	12.5	17 14.1	3.4	54.3
S	09	317 39.0	·· 35.4	80 54.8	12.5	17 17.5	3.2	54.3
U	10	332 39.2	36.4	95 26.3	12.5	17 20.7	3.2	54.3
N	11	347 39.4	37.3	109 57.8	12.5	17 23.9	3.1	54.3
D	12	2 39.6	S 3 38.3	124 29.3	12.5	N17 27.0	3.0	54.3
A	13	17 39.8	39.3	139 00.8	12.5	17 30.0	2.9	54.3
Y	14	32 40.0	40.2	153 32.3	12.4	17 32.9	2.9	54.3
	15	47 40.2	·· 41.2	168 03.7	12.5	17 35.8	2.7	54.3
	16	62 40.4	42.2	182 35.2	12.4	17 38.5	2.7	54.3
	17	77 40.6	43.1	197 06.6	12.5	17 41.2	2.6	54.2
	18	92 40.8	S 3 44.1	211 38.1	12.4	N17 43.8	2.5	54.2
	19	107 41.0	45.1	226 09.5	12.5	17 46.3	2.5	54.2
	20	122 41.2	46.0	240 41.0	12.4	17 48.8	2.3	54.2
	21	137 41.4	·· 47.0	255 12.4	12.4	17 51.1	2.3	54.2
	22	152 41.6	48.0	269 43.8	12.4	17 53.4	2.2	54.2
	23	167 41.8	48.9	284 15.2	12.4	17 55.6	2.1	54.2
	3 00	182 42.0	S 3 49.9	298 46.6	12.4	N17 57.7	2.0	54.2
	01	197 42.2	50.9	313 18.0	12.4	17 59.7	2.0	54.2
	02	212 42.4	51.8	327 49.4	12.4	18 01.7	1.8	54.2
	03	227 42.6	·· 52.8	342 20.8	12.4	18 03.5	1.8	54.2
	04	242 42.8	53.8	356 52.2	12.4	18 05.3	1.7	54.2
	05	257 43.0	54.7	11 23.6	12.4	18 07.0	1.6	54.2
	06	272 43.2	S 3 55.7	25 55.0	12.4	N18 08.6	1.5	54.2
	07	287 43.4	56.7	40 26.4	12.3	18 10.1	1.5	54.2
	08	302 43.6	57.6	54 57.7	12.4	18 11.6	1.3	54.2
M	09	317 43.8	·· 58.6	69 29.1	12.4	18 12.9	1.3	54.2
O	10	332 44.0	3 59.6	84 00.5	12.3	18 14.2	1.2	54.2
N	11	347 44.2	4 00.5	98 31.8	12.4	18 15.4	1.1	54.2
D	12	2 44.4	S 4 01.5	113 03.2	12.3	N18 16.5	1.0	54.2
A	13	17 44.6	02.5	127 34.5	12.4	18 17.5	1.0	54.2
Y	14	32 44.8	03.4	142 05.9	12.3	18 18.5	0.8	54.2
	15	47 44.9	·· 04.4	156 37.2	12.3	18 19.3	0.8	54.2
	16	62 45.1	05.4	171 08.5	12.4	18 20.1	0.7	54.2
	17	77 45.3	06.3	185 39.9	12.3	18 20.8	0.6	54.2
	18	92 45.5	S 4 07.3	200 11.2	12.3	N18 21.4	0.5	54.2
	19	107 45.7	08.3	214 42.5	12.4	18 21.9	0.4	54.2
	20	122 45.9	09.2	229 13.9	12.3	18 22.3	0.4	54.2
	21	137 46.1	·· 10.2	243 45.2	12.3	18 22.7	0.3	54.2
	22	152 46.3	11.1	258 16.5	12.3	18 23.0	0.1	54.2
	23	167 46.5	12.1	272 47.8	12.3	18 23.1	0.1	54.2
		S.D. 16.0	*d* 1.0	S.D. 14.9		14.8		14.8

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 1	Moonrise 2	Moonrise 3	Moonrise 4
°	h m	h m	h m	h m	h m	h m	h m
N 72	03 53	05 15	06 22	16 54	16 42	☐	☐
N 70	04 05	05 18	06 19	17 35	17 50	18 20	19 13
68	04 14	05 20	06 16	18 04	18 26	19 02	19 54
66	04 22	05 22	06 13	18 25	18 52	19 31	20 22
64	04 28	05 24	06 11	18 42	19 12	19 52	20 43
62	04 33	05 25	06 09	18 56	19 29	20 10	21 00
60	04 37	05 26	06 07	19 08	19 42	20 24	21 14
N 58	04 41	05 27	06 06	19 19	19 54	20 37	21 27
56	04 44	05 27	06 05	19 28	20 04	20 47	21 37
54	04 47	05 28	06 03	19 36	20 13	20 57	21 46
52	04 49	05 29	06 02	19 43	20 21	21 05	21 55
50	04 51	05 29	06 01	19 50	20 29	21 13	22 02
45	04 56	05 30	05 59	20 04	20 44	21 29	22 18
N 40	04 59	05 30	05 57	20 15	20 57	21 42	22 31
35	05 01	05 30	05 55	20 25	21 08	21 53	22 42
30	05 02	05 30	05 54	20 34	21 17	22 03	22 52
20	05 03	05 29	05 51	20 49	21 34	22 20	23 08
N 10	05 03	05 28	05 49	21 02	21 48	22 35	23 23
0	05 01	05 25	05 46	21 14	22 02	22 49	23 36
S 10	04 58	05 23	05 44	21 27	22 15	23 03	23 50
20	04 53	05 19	05 41	21 40	22 29	23 18	24 04
30	04 45	05 13	05 37	21 55	22 46	23 35	24 21
35	04 40	05 10	05 35	22 04	22 56	23 45	24 31
40	04 34	05 06	05 33	22 14	23 07	23 56	24 42
45	04 26	05 01	05 31	22 26	23 20	24 09	00 09
S 50	04 16	04 55	05 27	22 41	23 36	24 26	00 26
52	04 11	04 52	05 26	22 48	23 43	24 33	00 33
54	04 05	04 48	05 24	22 55	23 51	24 42	00 42
56	03 59	04 45	05 22	23 04	24 01	00 01	00 51
58	03 52	04 41	05 20	23 13	24 11	00 11	01 02
S 60	03 43	04 36	05 18	23 24	24 23	00 23	01 15

Lat.	Sunset	Twilight Civil	Twilight Naut.	Moonset 1	Moonset 2	Moonset 3	Moonset 4
°	h m	h m	h m	h m	h m	h m	h m
N 72	17 14	18 21	19 42	13 02	14 51	☐	☐
N 70	17 18	18 18	19 31	12 21	13 44	14 52	15 37
68	17 21	18 16	19 22	11 53	13 08	14 10	14 56
66	17 24	18 15	19 15	11 32	12 42	13 42	14 28
64	17 26	18 13	19 09	11 16	12 22	13 20	14 07
62	17 28	18 12	19 04	11 02	12 06	13 03	13 50
60	17 30	18 11	19 00	10 50	11 53	12 48	13 35
N 58	17 32	18 11	18 56	10 40	11 41	12 36	13 23
56	17 33	18 10	18 53	10 32	11 31	12 25	13 12
54	17 34	18 10	18 51	10 24	11 22	12 16	13 03
52	17 36	18 09	18 48	10 17	11 15	12 07	12 55
50	17 37	18 09	18 46	10 11	11 07	12 00	12 47
45	17 39	18 08	18 42	09 57	10 52	11 44	12 31
N 40	17 41	18 08	18 39	09 46	10 40	11 31	12 18
35	17 43	18 08	18 37	09 37	10 29	11 19	12 07
30	17 45	18 08	18 36	09 29	10 20	11 10	11 57
20	17 47	18 09	18 35	09 14	10 04	10 53	11 40
N 10	17 50	18 11	18 35	09 02	09 50	10 38	11 26
0	17 53	18 13	18 37	08 50	09 37	10 24	11 12
S 10	17 55	18 16	18 41	08 39	09 24	10 11	10 58
20	17 58	18 20	18 46	08 26	09 10	09 56	10 43
30	18 02	18 26	18 54	08 12	08 54	09 39	10 26
35	18 04	18 29	18 59	08 04	08 45	09 29	10 16
40	18 06	18 33	19 06	07 54	08 35	09 18	10 05
45	18 09	18 39	19 14	07 44	08 22	09 05	09 52
S 50	18 12	18 45	19 24	07 30	08 07	08 49	09 35
52	18 14	18 48	19 29	07 24	08 00	08 41	09 28
54	18 16	18 52	19 35	07 18	07 52	08 33	09 19
56	18 18	18 55	19 41	07 10	07 44	08 23	09 10
58	18 20	19 00	19 49	07 02	07 34	08 13	08 59
S 60	18 22	19 05	19 57	06 52	07 23	08 00	08 46

Day	SUN Eqn. of Time 00ʰ	SUN Eqn. of Time 12ʰ	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
	m s	m s	h m	h m	h m	d	
1	10 09	10 19	11 50	02 39	15 02	18	◑
2	10 29	10 38	11 49	03 26	15 49	19	
3	10 48	10 57	11 49	04 13	16 37	20	

1977 OCTOBER 4, 5, 6 (TUES., WED., THURS.)

G.M.T.		ARIES	VENUS −3.4		MARS +0.8		JUPITER −1.9		SATURN +0.8	
		G.H.A	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec	G.H.A.	Dec.
d	h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
4	00	12 34.2	206 55.5	N 7 30.0	261 51.2	N22 47.0	276 38.3	N22 57.2	223 20.8	N13 41.6
	01	27 36.6	221 55.1	28.9	276 52.2	46.9	291 40.6	57.2	238 23.0	41.5
	02	42 39.1	236 54.7	27.7	291 53.3	46.8	306 42.9	57.2	253 25.2	41.5
	03	57 41.6	251 54.2	·· 26.6	306 54.3	·· 46.6	321 45.2	·· 57.2	268 27.4	·· 41.4
	04	72 44.0	266 53.8	25.5	321 55.3	46.5	336 47.5	57.2	283 29.6	41.3
	05	87 46.5	281 53.4	24.4	336 56.4	46.4	351 49.8	57.2	298 31.8	41.2
	06	102 48.9	296 53.0	N 7 23.3	351 57.4	N22 46.2	6 52.0	N22 57.2	313 34.1	N13 41.1
	07	117 51.4	311 52.6	22.1	6 58.5	46.1	21 54.3	57.2	328 36.3	41.1
TUESDAY	08	132 53.9	326 52.2	21.0	21 59.5	46.0	36 56.6	57.2	343 38.5	41.0
	09	147 56.3	341 51.7	·· 19.9	37 00.5	·· 45.9	51 58.9	·· 57.2	358 40.7	·· 40.9
	10	162 58.8	356 51.3	18.8	52 01.6	45.7	67 01.2	57.1	13 42.9	40.8
	11	178 01.3	11 50.9	17.6	67 02.6	45.6	82 03.5	57.1	28 45.1	40.7
	12	193 03.7	26 50.5	N 7 16.5	82 03.7	N22 45.5	97 05.8	N22 57.1	43 47.3	N13 40.6
	13	208 06.2	41 50.1	15.4	97 04.7	45.3	112 08.1	57.1	58 49.5	40.6
	14	223 08.7	56 49.7	14.3	112 05.8	45.2	127 10.4	57.1	73 51.7	40.5
	15	238 11.1	71 49.3	·· 13.1	127 06.8	·· 45.1	142 12.6	·· 57.1	88 54.0	·· 40.4
	16	253 13.6	86 48.8	12.0	142 07.8	45.0	157 14.9	57.1	103 56.2	40.3
	17	268 16.1	101 48.4	10.9	157 08.9	44.8	172 17.2	57.1	118 58.4	40.2
	18	283 18.5	116 48.0	N 7 09.8	172 09.9	N22 44.7	187 19.5	N22 57.1	134 00.6	N13 40.1
	19	298 21.0	131 47.6	08.6	187 11.0	44.6	202 21.8	57.1	149 02.8	40.1
	20	313 23.4	146 47.2	07.5	202 12.0	44.4	217 24.1	57.1	164 05.0	40.0
	21	328 25.9	161 46.8	·· 06.4	217 13.1	·· 44.3	232 26.4	·· 57.1	179 07.2	·· 39.9
	22	343 28.4	176 46.4	05.3	232 14.1	44.2	247 28.7	57.1	194 09.4	39.8
	23	358 30.8	191 45.9	04.1	247 15.2	44.0	262 31.0	57.1	209 11.7	39.7
5	00	13 33.3	206 45.5	N 7 03.0	262 16.2	N22 43.9	277 33.3	N22 57.1	224 13.9	N13 39.7
	01	28 35.8	221 45.1	01.9	277 17.3	43.8	292 35.6	57.1	239 16.1	39.6
	02	43 38.2	236 44.7	7 00.7	292 18.3	43.6	307 37.9	57.1	254 18.3	39.5
	03	58 40.7	251 44.3	·· 6 59.6	307 19.4	·· 43.5	322 40.2	·· 57.1	269 20.5	·· 39.4
	04	73 43.2	266 43.9	58.5	322 20.4	43.4	337 42.5	57.1	284 22.7	39.3
	05	88 45.6	281 43.5	57.4	337 21.5	43.2	352 44.8	57.1	299 24.9	39.2
	06	103 48.1	296 43.1	N 6 56.2	352 22.5	N22 43.1	7 47.1	N22 57.1	314 27.1	N13 39.2
WEDNESDAY	07	118 50.6	311 42.6	55.1	7 23.6	43.0	22 49.3	57.1	329 29.4	39.1
	08	133 53.0	326 42.2	54.0	22 24.6	42.8	37 51.6	57.0	344 31.6	39.0
	09	148 55.5	341 41.8	·· 52.8	37 25.7	·· 42.7	52 53.9	·· 57.0	359 33.8	·· 38.9
	10	163 57.9	356 41.4	51.7	52 26.7	42.6	67 56.2	57.0	14 36.0	38.8
	11	179 00.4	11 41.0	50.6	67 27.8	42.5	82 58.5	57.0	29 38.2	38.8
	12	194 02.9	26 40.6	N 6 49.4	82 28.8	N22 42.3	98 00.8	N22 57.0	44 40.4	N13 38.7
	13	209 05.3	41 40.2	48.3	97 29.9	42.2	113 03.1	57.0	59 42.6	38.6
	14	224 07.8	56 39.8	47.2	112 30.9	42.1	128 05.4	57.0	74 44.9	38.5
	15	239 10.3	71 39.3	·· 46.0	127 32.0	·· 41.9	143 07.7	·· 57.0	89 47.1	·· 38.4
	16	254 12.7	86 38.9	44.9	142 33.0	41.8	158 10.0	57.0	104 49.3	38.4
	17	269 15.2	101 38.5	43.8	157 34.1	41.7	173 12.3	57.0	119 51.5	38.3
	18	284 17.7	116 38.1	N 6 42.6	172 35.2	N22 41.5	188 14.6	N22 57.0	134 53.7	N13 38.2
	19	299 20.1	131 37.7	41.5	187 36.2	41.4	203 16.9	57.0	149 55.9	38.1
	20	314 22.6	146 37.3	40.4	202 37.3	41.3	218 19.2	57.0	164 58.1	38.0
	21	329 25.0	161 36.9	·· 39.2	217 38.3	·· 41.1	233 21.5	·· 57.0	180 00.4	·· 37.9
	22	344 27.5	176 36.5	38.1	232 39.4	41.0	248 23.8	57.0	195 02.6	37.9
	23	359 30.0	191 36.1	36.9	247 40.4	40.9	263 26.1	57.0	210 04.8	37.8
6	00	14 32.4	206 35.7	N 6 35.8	262 41.5	N22 40.7	278 28.4	N22 57.0	225 07.0	N13 37.7
	01	29 34.9	221 35.2	34.7	277 42.6	40.6	293 30.7	57.0	240 09.2	37.6
	02	44 37.4	236 34.8	33.5	292 43.6	40.4	308 33.0	57.0	255 11.4	37.5
	03	59 39.8	251 34.4	·· 32.4	307 44.7	·· 40.3	323 35.3	·· 57.0	270 13.7	·· 37.5
	04	74 42.3	266 34.0	31.3	322 45.7	40.2	338 37.7	57.0	285 15.9	37.4
	05	89 44.8	281 33.6	30.1	337 46.8	40.0	353 40.0	57.0	300 18.1	37.3
	06	104 47.2	296 33.2	N 6 29.0	352 47.9	N22 39.9	8 42.3	N22 57.0	315 20.3	N13 37.2
	07	119 49.7	311 32.8	27.8	7 48.9	39.8	23 44.6	57.0	330 22.5	37.1
THURSDAY	08	134 52.2	326 32.4	26.7	22 50.0	39.6	38 46.9	57.0	345 24.7	37.1
	09	149 54.6	341 32.0	·· 25.6	37 51.1	·· 39.5	53 49.2	·· 56.9	0 26.9	·· 37.0
	10	164 57.1	356 31.6	24.4	52 52.1	39.4	68 51.5	56.9	15 29.2	36.9
	11	179 59.5	11 31.2	23.3	67 53.2	39.2	83 53.8	56.9	30 31.4	36.8
	12	195 02.0	26 30.8	N 6 22.1	82 54.2	N22 39.1	98 56.1	N22 56.9	45 33.6	N13 36.7
	13	210 04.5	41 30.4	21.0	97 55.3	39.0	113 58.4	56.9	60 35.8	36.7
	14	225 06.9	56 29.9	19.8	112 56.4	38.8	129 00.7	56.9	75 38.0	36.6
	15	240 09.4	71 29.5	·· 18.7	127 57.4	·· 38.7	144 03.0	·· 56.9	90 40.2	·· 36.5
	16	255 11.9	86 29.1	17.6	142 58.5	38.6	159 05.3	56.9	105 42.5	36.4
	17	270 14.3	101 28.7	16.4	157 59.6	38.4	174 07.6	56.9	120 44.7	36.3
	18	285 16.8	116 28.3	N 6 15.3	173 00.6	N22 38.3	189 09.9	N22 56.9	135 46.9	N13 36.2
	19	300 19.3	131 27.9	14.1	188 01.7	38.1	204 12.2	56.9	150 49.1	36.2
	20	315 21.7	146 27.5	13.0	203 02.8	38.0	219 14.6	56.9	165 51.3	36.1
	21	330 24.2	161 27.1	·· 11.8	218 03.8	·· 37.9	234 16.9	·· 56.9	180 53.6	·· 36.0
	22	345 26.7	176 26.7	10.7	233 04.9	37.7	249 19.2	56.9	195 55.8	35.9
	23	0 29.1	191 26.3	09.5	248 06.0	37.6	264 21.5	56.9	210 58.0	35.8
Mer. Pass.		h m 23 02.0	v −0.4	d 1.1	v 1.1	d 0.1	v 2.3	d 0.0	v 2.2	d 0.1

STARS		
Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 38.4	S40 23.5
Achernar	335 46.3	S57 20.9
Acrux	173 40.0	S62 58.5
Adhara	255 33.7	S28 56.3
Aldebaran	291 20.1	N16 27.9
Alioth	166 44.9	N56 04.9
Alkaid	153 20.6	N49 25.6
Al Na'ir	28 17.2	S47 04.1
Alnilam	276 13.6	S 1 12.9
Alphard	218 22.7	S 8 33.6
Alphecca	126 34.1	N26 47.6
Alpheratz	358 11.0	N28 58.2
Altair	62 34.4	N 8 48.8
Ankaa	353 41.8	S42 25.5
Antares	112 59.5	S26 22.9
Arcturus	146 20.6	N19 18.1
Atria	108 25.8	S68 59.4
Avior	234 29.2	S59 26.1
Bellatrix	279 00.8	N 6 19.8
Betelgeuse	271 30.4	N 7 24.2
Canopus	264 08.0	S52 40.8
Capella	281 14.0	N45 58.4
Deneb	49 49.6	N45 12.4
Denebola	183 01.4	N14 41.9
Diphda	349 22.6	S18 06.4
Dubhe	194 25.3	N61 52.1
Elnath	278 46.5	N28 35.2
Eltanin	90 58.8	N51 29.9
Enif	34 13.3	N 9 46.6
Fomalhaut	15 53.3	S29 44.3
Gacrux	172 31.4	S56 59.2
Gienah	176 20.3	S17 25.0
Hadar	149 26.7	S60 16.0
Hamal	328 30.8	N23 21.5
Kaus Aust.	84 19.5	S34 23.7
Kochab	137 20.1	N74 15.0
Markab	14 04.8	N15 05.3
Menkar	314 42.9	N 4 00.2
Menkent	148 39.7	S36 15.6
Miaplacidus	221 45.8	S69 37.4
Mirfak	309 18.5	N49 46.8
Nunki	76 31.7	S26 19.4
Peacock	54 01.4	S56 48.5
Pollux	244 00.7	N28 04.7
Procyon	245 27.9	N 5 16.9
Rasalhague	96 31.6	N12 34.8
Regulus	208 12.4	N12 04.6
Rigel	281 37.8	S 8 13.5
Rigil Kent.	140 29.0	S60 44.6
Sabik	102 43.6	S15 41.7
Schedar	350 10.6	N56 25.0
Shaula	96 58.6	S37 05.3
Sirius	258 57.4	S16 41.0
Spica	159 00.0	S11 02.6
Suhail	223 12.4	S43 20.4
Vega	80 57.2	N38 46.2
Zuben'ubi	137 35.5	S15 56.8

	S.H.A.	Mer. Pass
	° ′	h m
Venus	193 12.2	10 13
Mars	248 42.9	6 30
Jupiter	264 00.0	5 29
Saturn	210 40.6	9 02

G.M.T.		SUN G.H.A.	SUN Dec.	MOON G.H.A.	MOON *v*	MOON Dec.	MOON *d*	MOON H.P.
d h		° ′	° ′	° ′	′	° ′	′	′
4 00		182 46.7	S 4 13.1	287 19.1	12.3	N18 23.2	0.0	54.2
01		197 46.9	14.0	301 50.4	12.4	18 23.2	0.0	54.2
02		212 47.1	15.0	316 21.8	12.3	18 23.2	0.2	54.2
03		227 47.3	· · 16.0	330 53.1	12.3	18 23.0	0.2	54.2
04		242 47.5	16.9	345 24.4	12.3	18 22.8	0.4	54.2
05		257 47.6	17.9	359 55.7	12.3	18 22.4	0.4	54.2
06		272 47.8	S 4 18.9	14 27.0	12.3	N18 22.0	0.5	54.2
07		287 48.0	19.8	28 58.3	12.3	18 21.5	0.5	54.2
08	TUESDAY	302 48.2	20.8	43 29.6	12.3	18 21.0	0.7	54.2
09		317 48.4	· · 21.8	58 00.9	12.3	18 20.3	0.7	54.2
10		332 48.6	22.7	72 32.2	12.3	18 19.6	0.9	54.2
11		347 48.8	23.7	87 03.5	12.3	18 18.7	0.9	54.3
12		2 49.0	S 4 24.7	101 34.8	12.3	N18 17.8	1.0	54.3
13		17 49.2	25.6	116 06.1	12.3	18 16.8	1.1	54.3
14		32 49.4	26.6	130 37.4	12.2	18 15.7	1.2	54.3
15		47 49.6	· · 27.5	145 08.6	12.3	18 14.5	1.2	54.3
16		62 49.7	28.5	159 39.9	12.3	18 13.3	1.4	54.3
17		77 49.9	29.5	174 11.2	12.3	18 11.9	1.4	54.3
18		92 50.1	S 4 30.4	188 42.5	12.3	N18 10.5	1.5	54.3
19		107 50.3	31.4	203 13.8	12.3	18 09.0	1.6	54.3
20		122 50.5	32.4	217 45.1	12.3	18 07.4	1.7	54.3
21		137 50.7	· · 33.3	232 16.4	12.3	18 05.7	1.7	54.3
22		152 50.9	34.3	246 47.7	12.3	18 04.0	1.9	54.3
23		167 51.1	35.2	261 19.0	12.3	18 02.1	1.9	54.4
5 00		182 51.3	S 4 36.2	275 50.3	12.3	N18 00.2	2.0	54.4
01		197 51.5	37.2	290 21.6	12.3	17 58.2	2.1	54.4
02		212 51.6	38.1	304 52.9	12.2	17 56.1	2.2	54.4
03		227 51.8	· · 39.1	319 24.1	12.3	17 53.9	2.2	54.4
04		242 52.0	40.1	333 55.4	12.3	17 51.7	2.4	54.4
05		257 52.2	41.0	348 26.7	12.3	17 49.3	2.4	54.4
06		272 52.4	S 4 42.0	2 58.0	12.3	N17 46.9	2.5	54.4
07	WEDNESDAY	287 52.6	42.9	17 29.3	12.3	17 44.4	2.6	54.4
08		302 52.8	43.9	32 00.6	12.3	17 41.8	2.7	54.5
09		317 53.0	· · 44.9	46 31.9	12.3	17 39.1	2.8	54.5
10		332 53.1	45.8	61 03.2	12.3	17 36.3	2.8	54.5
11		347 53.3	46.8	75 34.5	12.3	17 33.5	2.9	54.5
12		2 53.5	S 4 47.8	90 05.8	12.3	N17 30.6	3.0	54.5
13		17 53.7	48.7	104 37.1	12.3	17 27.6	3.1	54.5
14		32 53.9	49.7	119 08.4	12.3	17 24.5	3.2	54.5
15		47 54.1	· · 50.6	133 39.7	12.3	17 21.3	3.3	54.5
16		62 54.3	51.6	148 11.0	12.3	17 18.0	3.3	54.6
17		77 54.4	52.6	162 42.3	12.3	17 14.7	3.4	54.6
18		92 54.6	S 4 53.5	177 13.6	12.3	N17 11.3	3.5	54.6
19		107 54.8	54.5	191 44.9	12.3	17 07.8	3.6	54.6
20		122 55.0	55.4	206 16.2	12.4	17 04.2	3.7	54.6
21		137 55.2	· · 56.4	220 47.6	12.3	17 00.5	3.7	54.6
22		152 55.4	57.4	235 18.9	12.3	16 56.8	3.8	54.7
23		167 55.6	58.3	249 50.2	12.3	16 53.0	4.0	54.7
6 00		182 55.7	S 4 59.3	264 21.5	12.3	N16 49.0	3.9	54.7
01		197 55.9	5 00.2	278 52.8	12.3	16 45.1	4.1	54.7
02		212 56.1	01.2	293 24.1	12.4	16 41.0	4.2	54.7
03		227 56.3	· · 02.2	307 55.5	12.3	16 36.8	4.2	54.7
04		242 56.5	03.1	322 26.8	12.3	16 32.6	4.3	54.8
05		257 56.7	04.1	336 58.1	12.3	16 28.3	4.4	54.8
06		272 56.8	S 5 05.0	351 29.4	12.3	N16 23.9	4.5	54.8
07		287 57.0	06.0	6 00.7	12.4	16 19.4	4.5	54.8
08	THURSDAY	302 57.2	07.0	20 32.1	12.3	16 14.9	4.6	54.8
09		317 57.4	· · 07.9	35 03.4	12.3	16 10.3	4.7	54.9
10		332 57.6	08.9	49 34.7	12.3	16 05.6	4.8	54.9
11		347 57.8	09.8	64 06.0	12.4	16 00.8	4.9	54.9
12		2 57.9	S 5 10.8	78 37.4	12.3	N15 55.9	4.9	54.9
13		17 58.1	11.8	93 08.7	12.3	15 51.0	5.1	54.9
14		32 58.3	12.7	107 40.0	12.3	15 45.9	5.1	55.0
15		47 58.5	· · 13.7	122 11.3	12.4	15 40.8	5.1	55.0
16		62 58.7	14.6	136 42.7	12.3	15 35.7	5.3	55.0
17		77 58.9	15.6	151 14.0	12.3	15 30.4	5.3	55.0
18		92 59.0	S 5 16.6	165 45.3	12.4	N15 25.1	5.4	55.1
19		107 59.2	17.5	180 16.7	12.3	15 19.7	5.5	55.1
20		122 59.4	18.5	194 48.0	12.3	15 14.2	5.6	55.1
21		137 59.6	· · 19.4	209 19.3	12.4	15 08.6	5.6	55.1
22		152 59.8	20.4	223 50.7	12.3	15 03.0	5.7	55.1
23		167 59.9	21.3	238 22.0	12.3	14 57.3	5.8	55.2
		S.D. 16.0	*d* 1.0	S.D. 14.8		14.9		15.0

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 4	Moonrise 5	Moonrise 6	Moonrise 7
°	h m	h m	h m	h m	h m	h m	h m
N 72	04 08	05 29	06 36	▭	19 33	21 21	23 06
N 70	04 18	05 30	06 31	19 13	20 29	21 56	23 29
68	04 25	05 31	06 26	19 54	21 02	22 20	23 46
66	04 32	05 32	06 23	20 22	21 26	22 39	24 00
64	04 37	05 32	06 20	20 43	21 45	22 55	24 11
62	04 41	05 33	06 17	21 00	22 00	23 07	24 21
60	04 45	05 33	06 15	21 14	22 13	23 18	24 29
N 58	04 48	05 33	06 12	21 27	22 24	23 27	24 36
56	04 50	05 33	06 11	21 37	22 33	23 36	24 43
54	04 52	05 34	06 09	21 46	22 42	23 43	24 48
52	04 54	05 34	06 07	21 55	22 50	23 49	24 53
50	04 56	05 34	06 06	22 02	22 56	23 55	24 58
45	04 59	05 33	06 03	22 18	23 11	24 08	00 08
N 40	05 02	05 33	06 00	22 31	23 23	24 18	00 18
35	05 03	05 32	05 58	22 42	23 33	24 27	00 27
30	05 04	05 32	05 56	22 52	23 42	24 35	00 35
20	05 04	05 30	05 52	23 08	23 58	24 48	00 48
N 10	05 03	05 27	05 48	23 23	24 11	00 11	01 00
0	05 00	05 24	05 45	23 36	24 24	00 24	01 11
S 10	04 56	05 21	05 42	23 50	24 36	00 36	01 22
20	04 50	05 16	05 38	24 04	00 04	00 50	01 34
30	04 42	05 10	05 34	24 21	00 21	01 05	01 47
35	04 36	05 06	05 31	24 31	00 31	01 14	01 55
40	04 29	05 01	05 28	24 42	00 42	01 24	02 04
45	04 20	04 55	05 25	00 09	00 55	01 36	02 14
S 50	04 09	04 48	05 21	00 26	01 10	01 51	02 26
52	04 03	04 45	05 19	00 33	01 18	01 57	02 32
54	03 57	04 41	05 17	00 42	01 26	02 05	02 38
56	03 50	04 37	05 15	00 51	01 35	02 13	02 45
58	03 42	04 32	05 12	01 02	01 46	02 22	02 53
S 60	03 33	04 26	05 09	01 15	01 58	02 33	03 02

Lat.	Sunset	Twilight Civil	Twilight Naut.	Moonset 4	Moonset 5	Moonset 6	Moonset 7
°	h m	h m	h m	h m	h m	h m	h m
N 72	16 59	18 06	19 25	▭	16 56	16 47	16 41
N 70	17 04	18 05	19 16	15 37	16 00	16 12	16 17
68	17 09	18 04	19 09	14 56	15 27	15 46	15 59
66	17 13	18 03	19 03	14 28	15 02	15 27	15 44
64	17 16	18 03	18 58	14 07	14 43	15 11	15 32
62	17 19	18 03	18 54	13 50	14 28	14 58	15 22
60	17 21	18 02	18 51	13 35	14 14	14 46	15 13
N 58	17 23	18 02	18 48	13 23	14 03	14 37	15 05
56	17 25	18 02	18 45	13 12	13 53	14 28	14 58
54	17 27	18 02	18 43	13 03	13 45	14 20	14 52
52	17 29	18 02	18 41	12 55	13 37	14 14	14 46
50	17 30	18 02	18 40	12 47	13 30	14 07	14 41
45	17 34	18 03	18 37	12 31	13 15	13 54	14 30
N 40	17 36	18 03	18 35	12 18	13 02	13 43	14 21
35	17 39	18 04	18 33	12 07	12 52	13 34	14 13
30	17 41	18 05	18 33	11 57	12 42	13 25	14 06
20	17 45	18 07	18 32	11 40	12 26	13 11	13 54
N 10	17 48	18 09	18 34	11 26	12 12	12 58	13 44
0	17 52	18 12	18 37	11 12	11 59	12 47	13 34
S 10	17 55	18 16	18 41	10 58	11 46	12 35	13 24
20	17 59	18 21	18 47	10 43	11 32	12 22	13 13
30	18 04	18 28	18 56	10 26	11 16	12 07	13 01
35	18 06	18 32	19 02	10 16	11 06	11 59	12 54
40	18 09	18 37	19 09	10 05	10 55	11 49	12 46
45	18 13	18 43	19 18	09 52	10 43	11 38	12 36
S 50	18 17	18 50	19 29	09 35	10 27	11 24	12 25
52	18 19	18 53	19 35	09 28	10 20	11 17	12 19
54	18 21	18 57	19 41	09 19	10 12	11 10	12 13
56	18 24	19 02	19 49	09 10	10 03	11 02	12 07
58	18 26	19 07	19 57	08 59	09 53	10 53	11 59
S 60	18 29	19 12	20 06	08 46	09 41	10 43	11 51

Day	SUN Eqn. of Time 00ʰ	SUN Eqn. of Time 12ʰ	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
	m s	m s	h m	h m	h m	d	
4	11 06	11 16	11 49	05 00	17 24	21	◑
5	11 25	11 34	11 48	05 48	18 11	22	
6	11 43	11 51	11 48	06 35	18 59	23	

1977 OCTOBER 7, 8, 9 (FRI., SAT., SUN.)

	G.M.T.	ARIES	VENUS −3.4		MARS +0.7		JUPITER −2.0		SATURN +0.8		STARS		
		G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	Name	S.H.A.	Dec.
	d h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	° ′
	7 00	15 31.6	206 25.9	N 6 08.4	263 07.1	N22 37.5	279 23.8	N22 56.9	226 00.2	N13 35.8	Acamar	315 38.4	S40 23.5
	01	30 34.0	221 25.5	07.3	278 08.1	37.3	294 26.1	56.9	241 02.4	35.7	Achernar	335 46.3	S57 20.9
	02	45 36.5	236 25.1	06.1	293 09.2	37.2	309 28.4	56.9	256 04.6	35.6	Acrux	173 40.0	S62 58.5
	03	60 39.0	251 24.7	·· 05.0	308 10.3	·· 37.0	324 30.7	·· 56.9	271 06.9	·· 35.5	Adhara	255 33.7	S28 56.3
	04	75 41.4	266 24.3	03.8	323 11.3	36.9	339 33.0	56.9	286 09.1	35.4	Aldebaran	291 20.1	N16 27.9
	05	90 43.9	281 23.9	02.7	338 12.4	36.8	354 35.4	56.9	301 11.3	35.4			
	06	105 46.4	296 23.4	N 6 01.5	353 13.5	N22 36.6	9 37.7	N22 56.9	316 13.5	N13 35.3	Alioth	166 44.9	N56 04.9
	07	120 48.8	311 23.0	6 00.4	8 14.6	36.5	24 40.0	56.9	331 15.7	35.2	Alkaid	153 20.6	N49 25.6
	08	135 51.3	326 22.6	5 59.2	23 15.6	36.4	39 42.3	56.9	346 18.0	35.1	Al Na'ir	28 17.2	S47 04.1
F	09	150 53.8	341 22.2	·· 58.1	38 16.7	·· 36.2	54 44.6	·· 56.9	1 20.2	·· 35.0	Alnilam	276 13.6	S 1 12.9
R	10	165 56.2	356 21.8	56.9	53 17.8	36.1	69 46.9	56.9	16 22.4	35.0	Alphard	218 22.7	S 8 33.6
I	11	180 58.7	11 21.4	55.8	68 18.9	35.9	84 49.2	56.9	31 24.6	34.9			
D	12	196 01.1	26 21.0	N 5 54.6	83 19.9	N22 35.8	99 51.6	N22 56.8	46 26.8	N13 34.8	Alphecca	126 34.1	N26 47.6
A	13	211 03.6	41 20.6	53.5	98 21.0	35.7	114 53.9	56.8	61 29.0	34.7	Alpheratz	358 11.0	N28 58.2
Y	14	226 06.1	56 20.2	52.3	113 22.1	35.5	129 56.2	56.8	76 31.3	34.6	Altair	62 34.4	N 8 48.8
	15	241 08.5	71 19.8	·· 51.2	128 23.2	·· 35.4	144 58.5	·· 56.8	91 33.5	·· 34.6	Ankaa	353 41.8	S42 25.5
	16	256 11.0	86 19.4	50.0	143 24.2	35.3	160 00.8	56.8	106 35.7	34.5	Antares	112 59.5	S26 22.9
	17	271 13.5	101 19.0	48.9	158 25.3	35.1	175 03.1	56.8	121 37.9	34.4			
	18	286 15.9	116 18.6	N 5 47.7	173 26.4	N22 35.0	190 05.4	N22 56.8	136 40.1	N13 34.3	Arcturus	146 20.6	N19 18.1
	19	301 18.4	131 18.2	46.6	188 27.5	34.8	205 07.8	56.8	151 42.4	34.2	Atria	108 25.8	S68 59.4
	20	316 20.9	146 17.8	45.4	203 28.5	34.7	220 10.1	56.8	166 44.6	34.2	Avior	234 29.2	S59 26.1
	21	331 23.3	161 17.4	·· 44.3	218 29.6	·· 34.6	235 12.4	·· 56.8	181 46.8	·· 34.1	Bellatrix	279 00.7	N 6 19.8
	22	346 25.8	176 17.0	43.1	233 30.7	34.4	250 14.7	56.8	196 49.0	34.0	Betelgeuse	271 30.3	N 7 24.2
	23	1 28.3	191 16.6	41.9	248 31.8	34.3	265 17.0	56.8	211 51.2	33.9			
	8 00	16 30.7	206 16.2	N 5 40.8	263 32.9	N22 34.1	280 19.4	N22 56.8	226 53.5	N13 33.9	Canopus	264 08.0	S52 40.8
	01	31 33.2	221 15.8	39.6	278 33.9	34.0	295 21.7	56.8	241 55.7	33.8	Capella	281 14.0	N45 58.4
	02	46 35.6	236 15.4	38.5	293 35.0	33.9	310 24.0	56.8	256 57.9	33.7	Deneb	49 49.6	N45 12.4
	03	61 38.1	251 15.0	·· 37.3	308 36.1	·· 33.7	325 26.3	·· 56.8	272 00.1	·· 33.6	Denebola	183 01.4	N14 41.8
	04	76 40.6	266 14.6	36.2	323 37.2	33.6	340 28.6	56.8	287 02.3	33.5	Diphda	349 22.6	S18 06.4
	05	91 43.0	281 14.2	35.0	338 38.3	33.4	355 31.0	56.8	302 04.6	33.5			
	06	106 45.5	296 13.8	N 5 33.9	353 39.4	N22 33.3	10 33.3	N22 56.8	317 06.8	N13 33.4	Dubhe	194 25.3	N61 52.1
	07	121 48.0	311 13.4	32.7	8 40.4	33.2	25 35.6	56.8	332 09.0	33.3	Elnath	278 46.5	N28 35.2
S	08	136 50.4	326 13.0	31.5	23 41.5	33.0	40 37.9	56.8	347 11.2	33.2	Eltanin	90 58.8	N51 29.9
A	09	151 52.9	341 12.6	·· 30.4	38 42.6	·· 32.9	55 40.2	·· 56.8	2 13.4	·· 33.1	Enif	34 13.3	N 9 46.6
T	10	166 55.4	356 12.2	29.2	53 43.7	32.7	70 42.6	56.8	17 15.7	33.1	Fomalhaut	15 53.3	S29 44.3
U	11	181 57.8	11 11.8	28.1	68 44.8	32.6	85 44.9	56.8	32 17.9	33.0			
R	12	197 00.3	26 11.4	N 5 26.9	83 45.9	N22 32.5	100 47.2	N22 56.8	47 20.1	N13 32.9	Gacrux	172 31.4	S56 59.2
D	13	212 02.8	41 11.0	25.8	98 47.0	32.3	115 49.5	56.8	62 22.3	32.8	Gienah	176 20.3	S17 25.0
A	14	227 05.2	56 10.6	24.6	113 48.1	32.2	130 51.9	56.8	77 24.6	32.7	Hadar	149 26.7	S60 15.9
Y	15	242 07.7	71 10.2	·· 23.4	128 49.1	·· 32.0	145 54.2	·· 56.8	92 26.8	·· 32.7	Hamal	328 30.8	N23 21.5
	16	257 10.1	86 09.8	22.3	143 50.2	31.9	160 56.5	56.8	107 29.0	32.6	Kaus Aust.	84 19.6	S34 23.7
	17	272 12.6	101 09.4	21.1	158 51.3	31.8	175 58.8	56.8	122 31.2	32.5			
	18	287 15.1	116 09.0	N 5 20.0	173 52.4	N22 31.6	191 01.2	N22 56.7	137 33.4	N13 32.4	Kochab	137 20.1	N74 15.0
	19	302 17.5	131 08.6	18.8	188 53.5	31.5	206 03.5	56.7	152 35.7	32.4	Markab	14 04.9	N15 05.4
	20	317 20.0	146 08.2	17.6	203 54.6	31.3	221 05.8	56.7	167 37.9	32.3	Menkar	314 42.9	N 4 00.2
	21	332 22.5	161 07.8	·· 16.5	218 55.7	·· 31.2	236 08.1	·· 56.7	182 40.1	·· 32.2	Menkent	148 39.7	S36 15.6
	22	347 24.9	176 07.4	15.3	233 56.8	31.0	251 10.5	56.7	197 42.3	32.1	Miaplacidus	221 45.7	S69 37.3
	23	2 27.4	191 07.0	14.2	248 57.9	30.9	266 12.8	56.7	212 44.6	32.0			
	9 00	17 29.9	206 06.6	N 5 13.0	263 59.0	N22 30.8	281 15.1	N22 56.7	227 46.8	N13 32.0	Mirfak	309 18.5	N49 46.9
	01	32 32.3	221 06.2	11.8	279 00.0	30.6	296 17.4	56.7	242 49.0	31.9	Nunki	76 31.7	S26 19.4
	02	47 34.8	236 05.8	10.7	294 01.1	30.5	311 19.8	56.7	257 51.2	31.8	Peacock	54 01.4	S56 48.5
	03	62 37.2	251 05.4	·· 09.5	309 02.2	·· 30.3	326 22.1	·· 56.7	272 53.4	·· 31.7	Pollux	244 00.7	N28 04.7
	04	77 39.7	266 05.0	08.3	324 03.3	30.2	341 24.4	56.7	287 55.7	31.6	Procyon	245 27.9	N 5 16.9
	05	92 42.2	281 04.6	07.2	339 04.4	30.0	356 26.8	56.7	302 57.9	31.6			
	06	107 44.6	296 04.2	N 5 06.0	354 05.5	N22 29.9	11 29.1	N22 56.7	318 00.1	N13 31.5	Rasalhague	96 31.6	N12 34.8
	07	122 47.1	311 03.8	04.9	9 06.6	29.8	26 31.4	56.7	333 02.3	31.4	Regulus	208 12.4	N12 04.6
	08	137 49.6	326 03.4	03.7	24 07.7	29.6	41 33.7	56.7	348 04.6	31.3	Rigel	281 37.8	S 8 13.5
S	09	152 52.0	341 03.0	·· 02.5	39 08.8	·· 29.5	56 36.1	·· 56.7	3 06.8	·· 31.3	Rigil Kent.	140 29.0	S60 44.6
U	10	167 54.5	356 02.6	01.4	54 09.9	29.3	71 38.4	56.7	18 09.0	31.2	Sabik	102 43.6	S15 41.7
N	11	182 57.0	11 02.2	5 00.2	69 11.0	29.2	86 40.7	56.7	33 11.2	31.1			
D	12	197 59.4	26 01.8	N 4 59.0	84 12.1	N22 29.0	101 43.1	N22 56.7	48 13.5	N13 31.0	Schedar	350 10.6	N56 25.0
A	13	213 01.9	41 01.4	57.9	99 13.2	28.9	116 45.4	56.7	63 15.7	30.9	Shaula	96 58.6	S37 05.3
Y	14	228 04.4	56 01.0	56.7	114 14.3	28.8	131 47.7	56.7	78 17.9	30.9	Sirius	258 57.4	S16 41.0
	15	243 06.8	71 00.6	·· 55.5	129 15.4	·· 28.6	146 50.1	·· 56.7	93 20.1	·· 30.8	Spica	159 00.0	S11 02.6
	16	258 09.3	86 00.2	54.4	144 16.5	28.5	161 52.4	56.7	108 22.4	30.7	Suhail	223 12.4	S43 20.4
	17	273 11.7	100 59.8	53.2	159 17.6	28.3	176 54.7	56.7	123 24.6	30.6			
	18	288 14.2	115 59.4	N 4 52.0	174 18.7	N22 28.2	191 57.1	N22 56.7	138 26.8	N13 30.6	Vega	80 57.2	N38 46.2
	19	303 16.7	130 59.0	50.9	189 19.8	28.0	206 59.4	56.7	153 29.0	30.5	Zuben'ubi	137 35.5	S15 56.8
	20	318 19.1	145 58.6	49.7	204 20.9	27.9	222 01.7	56.7	168 31.3	30.4			
	21	333 21.6	160 58.2	·· 48.5	219 22.0	·· 27.8	237 04.1	·· 56.7	183 33.5	·· 30.3			
	22	348 24.1	175 57.8	47.4	234 23.1	27.6	252 06.4	56.7	198 35.7	30.2			
	23	3 26.5	190 57.4	46.2	249 24.2	27.5	267 08.7	56.7	213 37.9	30.2			
	Mer. Pass.	h m 22 50.2	*v* −0.4	*d* 1.2	*v* 1.1	*d* 0.1	*v* 2.3	*d* 0.0	*v* 2.2	*d* 0.1			

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	189 45.5	10 15
Mars	247 02.1	6 25
Jupiter	263 48.6	5 18
Saturn	210 22.7	8 51

G.M.T.	SUN G.H.A.	SUN Dec.	MOON G.H.A.	MOON v	MOON Dec.	MOON d	MOON H.P.
d h	° ′	° ′	° ′	′	° ′	′	′
7 00	183 00.1	S 5 22.3	252 53.3	12.3	N14 51.5	5.9	55.2
01	198 00.3	23.3	267 24.6	12.4	14 45.6	5.9	55.2
02	213 00.5	24.2	281 56.0	12.3	14 39.7	6.0	55.2
03	228 00.7	·· 25.2	296 27.3	12.3	14 33.7	6.1	55.3
04	243 00.8	26.1	310 58.6	12.4	14 27.6	6.2	55.3
05	258 01.0	27.1	325 30.0	12.3	14 21.4	6.2	55.3
06	273 01.2	S 5 28.1	340 01.3	12.3	N14 15.2	6.3	55.3
07	288 01.4	29.0	354 32.6	12.3	14 08.9	6.4	55.4
08	303 01.6	30.0	9 03.9	12.3	14 02.5	6.5	55.4
F 09	318 01.7	·· 30.9	23 35.2	12.4	13 56.0	6.5	55.4
R 10	333 01.9	31.9	38 06.6	12.3	13 49.5	6.6	55.4
I 11	348 02.1	32.8	52 37.9	12.3	13 42.9	6.7	55.5
D 12	3 02.3	S 5 33.8	67 09.2	12.3	N13 36.2	6.7	55.5
A 13	18 02.4	34.7	81 40.5	12.3	13 29.5	6.8	55.5
Y 14	33 02.6	35.7	96 11.8	12.3	13 22.7	6.9	55.5
15	48 02.8	·· 36.7	110 43.1	12.3	13 15.8	7.0	55.6
16	63 03.0	37.6	125 14.4	12.3	13 08.8	7.0	55.6
17	78 03.2	38.6	139 45.7	12.3	13 01.8	7.1	55.6
18	93 03.3	S 5 39.5	154 17.0	12.3	N12 54.7	7.1	55.7
19	108 03.5	40.5	168 48.3	12.3	12 47.6	7.3	55.7
20	123 03.7	41.4	183 19.6	12.2	12 40.3	7.3	55.7
21	138 03.9	·· 42.4	197 50.8	12.3	12 33.0	7.3	55.7
22	153 04.0	43.3	212 22.1	12.3	12 25.7	7.5	55.8
23	168 04.2	44.3	226 53.4	12.3	12 18.2	7.5	55.8
8 00	183 04.4	S 5 45.3	241 24.7	12.2	N12 10.7	7.5	55.8
01	198 04.6	46.2	255 55.9	12.3	12 03.2	7.7	55.9
02	213 04.7	47.2	270 27.2	12.2	11 55.5	7.7	55.9
03	228 04.9	·· 48.1	284 58.4	12.3	11 47.8	7.8	55.9
04	243 05.1	49.1	299 29.7	12.2	11 40.0	7.8	56.0
05	258 05.3	50.0	314 00.9	12.2	11 32.2	7.9	56.0
06	273 05.4	S 5 51.0	328 32.1	12.2	N11 24.3	8.0	56.0
07	288 05.6	51.9	343 03.3	12.2	11 16.3	8.0	56.0
S 08	303 05.8	52.9	357 34.5	12.2	11 08.3	8.1	56.1
A 09	318 06.0	·· 53.9	12 05.7	12.2	11 00.2	8.1	56.1
T 10	333 06.1	54.8	26 36.9	12.2	10 52.1	8.2	56.1
U 11	348 06.3	55.8	41 08.1	12.2	10 43.9	8.3	56.2
R 12	3 06.5	S 5 56.7	55 39.3	12.2	N10 35.6	8.4	56.2
D 13	18 06.7	57.7	70 10.5	12.1	10 27.2	8.4	56.2
A 14	33 06.8	58.6	84 41.6	12.2	10 18.8	8.4	56.3
Y 15	48 07.0	5 59.6	99 12.8	12.1	10 10.4	8.5	56.3
16	63 07.2	6 00.5	113 43.9	12.2	10 01.9	8.6	56.3
17	78 07.4	01.5	128 15.1	12.1	9 53.3	8.7	56.4
18	93 07.5	S 6 02.4	142 46.2	12.1	N 9 44.6	8.6	56.4
19	108 07.7	03.4	157 17.3	12.1	9 36.0	8.8	56.4
20	123 07.9	04.3	171 48.4	12.1	9 27.2	8.8	56.5
21	138 08.0	·· 05.3	186 19.5	12.0	9 18.4	8.9	56.5
22	153 08.2	06.2	200 50.5	12.1	9 09.5	8.9	56.5
23	168 08.4	07.2	215 21.6	12.0	9 00.6	9.0	56.6
9 00	183 08.6	S 6 08.1	229 52.6	12.1	N 8 51.6	9.0	56.6
01	198 08.7	09.1	244 23.7	12.0	8 42.6	9.1	56.6
02	213 08.9	10.0	258 54.7	12.0	8 33.5	9.2	56.7
03	228 09.1	·· 11.0	273 25.7	12.0	8 24.3	9.2	56.7
04	243 09.2	12.0	287 56.7	11.9	8 15.1	9.2	56.7
05	258 09.4	12.9	302 27.6	12.0	8 05.9	9.3	56.8
06	273 09.6	S 6 13.9	316 58.6	11.9	N 7 56.6	9.4	56.8
07	288 09.8	14.8	331 29.5	12.0	7 47.2	9.4	56.8
08	303 09.9	15.8	346 00.5	11.9	7 37.8	9.4	56.9
S 09	318 10.1	·· 16.7	0 31.4	11.8	7 28.4	9.5	56.9
U 10	333 10.3	17.7	15 02.2	11.9	7 18.9	9.6	56.9
N 11	348 10.4	18.6	29 33.1	11.9	7 09.3	9.6	57.0
D 12	3 10.6	S 6 19.6	44 04.0	11.8	N 6 59.7	9.6	57.0
A 13	18 10.8	20.5	58 34.8	11.8	6 50.1	9.7	57.0
Y 14	33 10.9	21.5	73 05.6	11.8	6 40.4	9.8	57.1
15	48 11.1	·· 22.4	87 36.4	11.8	6 30.6	9.7	57.1
16	63 11.3	23.4	102 07.2	11.7	6 20.9	9.9	57.1
17	78 11.5	24.3	116 37.9	11.8	6 11.0	9.8	57.2
18	93 11.6	S 6 25.3	131 08.7	11.7	N 6 01.2	10.0	57.2
19	108 11.8	26.2	145 39.4	11.7	5 51.2	9.9	57.2
20	123 12.0	27.2	160 10.1	11.6	5 41.3	10.0	57.3
21	138 12.1	·· 28.1	174 40.7	11.7	5 31.3	10.1	57.3
22	153 12.3	29.1	189 11.4	11.6	5 21.2	10.0	57.3
23	168 12.5	30.0	203 42.0	11.6	5 11.2	10.2	57.4
	S.D. 16.0	d 1.0	S.D. 15.1		15.3		15.5

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 7	Moonrise 8	Moonrise 9	Moonrise 10
°	h m	h m	h m	h m	h m	h m	h m
N 72	04 23	05 42	06 50	23 06	24 51	00 51	02 37
N 70	04 30	05 42	06 43	23 29	25 05	01 05	02 44
68	04 37	05 41	06 37	23 46	25 16	01 16	02 49
66	04 42	05 41	06 33	24 00	00 00	01 25	02 53
64	04 46	05 41	06 28	24 11	00 11	01 32	02 57
62	04 49	05 40	06 25	24 21	00 21	01 39	03 00
60	04 52	05 40	06 22	24 29	00 29	01 44	03 03
N 58	04 54	05 40	06 19	24 36	00 36	01 49	03 05
56	04 56	05 39	06 17	24 43	00 43	01 53	03 08
54	04 58	05 39	06 14	24 48	00 48	01 57	03 09
52	04 59	05 39	06 12	24 53	00 53	02 01	03 11
50	05 01	05 38	06 10	24 58	00 58	02 04	03 13
45	05 03	05 37	06 06	00 08	01 08	02 11	03 16
N 40	05 05	05 36	06 03	00 18	01 16	02 17	03 19
35	05 05	05 35	06 00	00 27	01 23	02 22	03 22
30	05 06	05 33	05 57	00 35	01 30	02 26	03 24
20	05 05	05 31	05 53	00 48	01 40	02 34	03 28
N 10	05 03	05 27	05 48	01 00	01 50	02 40	03 31
0	04 59	05 24	05 44	01 11	01 59	02 46	03 35
S 10	04 54	05 19	05 40	01 22	02 07	02 53	03 38
20	04 47	05 13	05 36	01 34	02 17	02 59	03 41
30	04 38	05 06	05 30	01 47	02 27	03 07	03 45
35	04 31	05 02	05 27	01 55	02 34	03 11	03 48
40	04 24	04 56	05 24	02 04	02 41	03 16	03 50
45	04 14	04 50	05 19	02 14	02 49	03 21	03 53
S 50	04 02	04 41	05 14	02 26	02 58	03 28	03 57
52	03 56	04 38	05 12	02 32	03 03	03 31	03 58
54	03 49	04 33	05 10	02 38	03 08	03 35	04 00
56	03 41	04 28	05 07	02 45	03 13	03 38	04 02
58	03 32	04 23	05 04	02 53	03 19	03 43	04 04
S 60	03 22	04 17	05 00	03 02	03 26	03 47	04 06

Lat.	Sunset	Twilight Civil	Twilight Naut.	Moonset 7	Moonset 8	Moonset 9	Moonset 10
°	h m	h m	h m	h m	h m	h m	h m
N 72	16 43	17 51	19 09	16 41	16 35	16 30	16 25
N 70	16 50	17 51	19 02	16 17	16 20	16 21	16 22
68	16 56	17 52	18 56	15 59	16 08	16 14	16 20
66	17 01	17 52	18 52	15 44	15 57	16 08	16 18
64	17 05	17 53	18 48	15 32	15 49	16 03	16 16
62	17 09	17 53	18 44	15 22	15 41	15 59	16 15
60	17 12	17 54	18 42	15 13	15 35	15 55	16 13
N 58	17 15	17 54	18 39	15 05	15 29	15 51	16 12
56	17 18	17 55	18 38	14 58	15 24	15 48	16 11
54	17 20	17 55	18 36	14 52	15 20	15 46	16 10
52	17 22	17 56	18 35	14 46	15 16	15 43	16 10
50	17 24	17 56	18 33	14 41	15 12	15 41	16 09
45	17 28	17 57	18 31	14 30	15 04	15 36	16 07
N 40	17 32	17 59	18 30	14 21	14 57	15 32	16 06
35	17 35	18 00	18 29	14 13	14 51	15 28	16 04
30	17 37	18 01	18 29	14 06	14 46	15 25	16 03
20	17 42	18 04	18 30	13 54	14 37	15 19	16 01
N 10	17 47	18 08	18 32	13 44	14 29	15 14	16 00
0	17 51	18 12	18 36	13 34	14 21	15 09	15 58
S 10	17 55	18 16	18 41	13 24	14 14	15 05	15 57
20	18 00	18 22	18 48	13 13	14 06	14 59	15 55
30	18 05	18 30	18 58	13 01	13 56	14 54	15 53
35	18 09	18 34	19 04	12 54	13 51	14 50	15 51
40	18 12	18 40	19 12	12 46	13 45	14 46	15 50
45	18 17	18 47	19 22	12 36	13 38	14 42	15 49
S 50	18 22	18 55	19 35	12 25	13 29	14 36	15 47
52	18 24	18 59	19 41	12 19	13 25	14 34	15 46
54	18 27	19 03	19 48	12 13	13 21	14 31	15 45
56	18 30	19 08	19 56	12 07	13 16	14 28	15 44
58	18 33	19 14	20 05	11 59	13 10	14 25	15 42
S 60	18 37	19 20	20 16	11 51	13 04	14 21	15 41

Day	SUN Eqn. of Time 00ʰ	SUN Eqn. of Time 12ʰ	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
	m s	m s	h m	h m	h m	d	
7	12 00	12 09	11 48	07 23	19 46	24	
8	12 17	12 26	11 48	08 10	20 34	25	◐
9	12 34	12 42	11 47	08 58	21 22	26	

1977 OCTOBER 10, 11, 12 (MON., TUES., WED.)

G.M.T.	ARIES	VENUS −3.4		MARS +0.7		JUPITER −2.0		SATURN +0.8	
	G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec
d h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
10 00	18 29.0	205 57.0	N 4 45.0	264 25.3	N22 27.3	282 11.1	N22 56.7	228 40.2	N13 30.1
01	33 31.5	220 56.6	43.8	279 26.4	27.2	297 13.4	56.7	243 42.4	30.0
02	48 33.9	235 56.2	42.7	294 27.5	27.0	312 15.7	56.7	258 44.6	29.9
03	63 36.4	250 55.8	·· 41.5	309 28.6	·· 26.9	327 18.1	·· 56.7	273 46.8	·· 29.9
04	78 38.9	265 55.4	40.3	324 29.7	26.7	342 20.4	56.7	288 49.1	29.8
05	93 41.3	280 55.0	39.2	339 30.8	26.6	357 22.8	56.7	303 51.3	29.7
06	108 43.8	295 54.6	N 4 38.0	354 32.0	N22 26.5	12 25.1	N22 56.7	318 53.5	N13 29.6
07	123 46.2	310 54.2	36.8	9 33.1	26.3	27 27.4	56.7	333 55.7	29.5
08	138 48.7	325 53.8	35.6	24 34.2	26.2	42 29.8	56.6	348 58.0	29.5
M 09	153 51.2	340 53.5	·· 34.5	39 35.3	·· 26.0	57 32.1	·· 56.6	4 00.2	·· 29.4
O 10	168 53.6	355 53.1	33.3	54 36.4	25.9	72 34.5	56.6	19 02.4	29.3
N 11	183 56.1	10 52.7	32.1	69 37.5	25.7	87 36.8	56.6	34 04.6	29.2
D 12	198 58.6	25 52.3	N 4 31.0	84 38.6	N22 25.6	102 39.1	N22 56.6	49 06.9	N13 29.2
A 13	214 01.0	40 51.9	29.8	99 39.7	25.4	117 41.5	56.6	64 09.1	29.1
Y 14	229 03.5	55 51.5	28.6	114 40.8	25.3	132 43.8	56.6	79 11.3	29.0
15	244 06.0	70 51.1	·· 27.4	129 41.9	·· 25.1	147 46.2	·· 56.6	94 13.5	·· 28.9
16	259 08.4	85 50.7	26.3	144 43.0	25.0	162 48.5	56.6	109 15.8	28.8
17	274 10.9	100 50.3	25.1	159 44.2	24.9	177 50.8	56.6	124 18.0	28.8
18	289 13.3	115 49.9	N 4 23.9	174 45.3	N22 24.7	192 53.2	N22 56.6	139 20.2	N13 28.7
19	304 15.8	130 49.5	22.7	189 46.4	24.6	207 55.5	56.6	154 22.5	28.6
20	319 18.3	145 49.1	21.6	204 47.5	24.4	222 57.9	56.6	169 24.7	28.5
21	334 20.7	160 48.7	·· 20.4	219 48.6	·· 24.3	238 00.2	·· 56.6	184 26.9	·· 28.5
22	349 23.2	175 48.3	19.2	234 49.7	24.1	253 02.6	56.6	199 29.1	28.4
23	4 25.7	190 47.9	18.0	249 50.8	24.0	268 04.9	56.6	214 31.4	28.3
11 00	19 28.1	205 47.5	N 4 16.9	264 52.0	N22 23.8	283 07.3	N22 56.6	229 33.6	N13 28.2
01	34 30.6	220 47.1	15.7	279 53.1	23.7	298 09.6	56.6	244 35.8	28.1
02	49 33.1	235 46.7	14.5	294 54.2	23.5	313 11.9	56.6	259 38.1	28.1
03	64 35.5	250 46.3	·· 13.4	309 55.3	·· 23.4	328 14.3	·· 56.6	274 40.3	·· 28.0
04	79 38.0	265 45.9	12.2	324 56.4	23.2	343 16.6	56.6	289 42.5	27.9
05	94 40.5	280 45.5	11.0	339 57.5	23.1	358 19.0	56.6	304 44.7	27.8
06	109 42.9	295 45.2	N 4 09.8	354 58.7	N22 22.9	13 21.3	N22 56.6	319 47.0	N13 27.8
07	124 45.4	310 44.8	08.7	9 59.8	22.8	28 23.7	56.6	334 49.2	27.7
T 08	139 47.8	325 44.4	07.5	25 00.9	22.7	43 26.0	56.6	349 51.4	27.6
U 09	154 50.3	340 44.0	·· 06.3	40 02.0	·· 22.5	58 28.4	·· 56.6	4 53.7	·· 27.5
E 10	169 52.8	355 43.6	05.1	55 03.1	22.4	73 30.7	56.6	19 55.9	27.5
S 11	184 55.2	10 43.2	03.9	70 04.3	22.2	88 33.1	56.5	34 58.1	27.4
D 12	199 57.7	25 42.8	N 4 02.8	85 05.4	N22 22.1	103 35.4	N22 56.5	50 00.3	N13 27.3
A 13	215 00.2	40 42.4	01.6	100 06.5	21.9	118 37.8	56.5	65 02.6	27.2
Y 14	230 02.6	55 42.0	4 00.4	115 07.6	21.8	133 40.1	56.5	80 04.8	27.2
15	245 05.1	70 41.6	3 59.2	130 08.8	·· 21.6	148 42.5	·· 56.5	95 07.0	·· 27.1
16	260 07.6	85 41.2	58.0	145 09.9	21.5	163 44.8	56.5	110 09.3	27.0
17	275 10.0	100 40.8	56.9	160 11.0	21.3	178 47.2	56.5	125 11.5	26.9
18	290 12.5	115 40.5	N 3 55.7	175 12.1	N22 21.2	193 49.5	N22 56.5	140 13.7	N13 26.9
19	305 15.0	130 40.1	54.5	190 13.3	21.0	208 51.9	56.5	155 15.9	26.8
20	320 17.4	145 39.7	53.3	205 14.4	20.9	223 54.2	56.5	170 18.2	26.7
21	335 19.9	160 39.3	·· 52.1	220 15.5	·· 20.7	238 56.6	·· 56.5	185 20.4	·· 26.6
22	350 22.3	175 38.9	51.0	235 16.6	20.6	253 58.9	56.5	200 22.6	26.5
23	5 24.8	190 38.5	49.8	250 17.8	20.4	269 01.3	56.5	215 24.9	26.5
12 00	20 27.3	205 38.1	N 3 48.6	265 18.9	N22 20.3	284 03.6	N22 56.5	230 27.1	N13 26.4
01	35 29.7	220 37.7	47.4	280 20.0	20.1	299 06.0	56.5	245 29.3	26.3
02	50 32.2	235 37.3	46.2	295 21.2	20.0	314 08.3	56.5	260 31.6	26.2
03	65 34.7	250 36.9	·· 45.1	310 22.3	·· 19.8	329 10.7	·· 56.5	275 33.8	·· 26.2
04	80 37.1	265 36.5	43.9	325 23.4	19.7	344 13.0	56.5	290 36.0	26.1
05	95 39.6	280 36.1	42.7	340 24.5	19.5	359 15.4	56.5	305 38.3	26.0
06	110 42.1	295 35.8	N 3 41.5	355 25.7	N22 19.4	14 17.7	N22 56.5	320 40.5	N13 25.9
W 07	125 44.5	310 35.4	40.3	10 26.8	19.2	29 20.1	56.5	335 42.7	25.9
E 08	140 47.0	325 35.0	39.1	25 27.9	19.1	44 22.5	56.5	350 45.0	25.8
D 09	155 49.5	340 34.6	·· 38.0	40 29.1	·· 18.9	59 24.8	·· 56.5	5 47.2	·· 25.7
N 10	170 51.9	355 34.2	36.8	55 30.2	18.8	74 27.2	56.5	20 49.4	25.6
E 11	185 54.4	10 33.8	35.6	70 31.3	18.6	89 29.5	56.5	35 51.6	25.6
S 12	200 56.8	25 33.4	N 3 34.4	85 32.5	N22 18.5	104 31.9	N22 56.5	50 53.9	N13 25.5
D 13	215 59.3	40 33.0	33.2	100 33.6	18.3	119 34.2	56.5	65 56.1	25.4
A 14	231 01.8	55 32.6	32.0	115 34.7	18.2	134 36.6	56.5	80 58.3	25.3
Y 15	246 04.2	70 32.2	·· 30.8	130 35.9	·· 18.0	149 39.0	·· 56.5	96 00.6	·· 25.3
16	261 06.7	85 31.8	29.7	145 37.0	17.9	164 41.3	56.5	111 02.8	25.2
17	276 09.2	100 31.5	28.5	160 38.1	17.7	179 43.7	56.5	126 05.0	25.1
18	291 11.6	115 31.1	N 3 27.3	175 39.3	N22 17.6	194 46.0	N22 56.5	141 07.3	N13 25.0
19	306 14.1	130 30.7	26.1	190 40.4	17.4	209 48.4	56.5	156 09.5	25.0
20	321 16.6	145 30.3	24.9	205 41.6	17.3	224 50.8	56.5	171 11.7	24.9
21	336 19.0	160 29.9	·· 23.7	220 42.7	·· 17.1	239 53.1	·· 56.5	186 14.0	·· 24.8
22	351 21.5	175 29.5	22.5	235 43.8	17.0	254 55.5	56.5	201 16.2	24.7
23	6 23.9	190 29.1	21.4	250 45.0	16.8	269 57.8	56.5	216 18.4	24.7
Mer. Pass.	h m 22 38.4	v −0.4	d 1.2	v 1.1	d 0.1	v 2.3	d 0.0	v 2.2	d 0.1

STARS		
Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 38.4	S40 23.5
Achernar	335 46.2	S57 20.9
Acrux	173 40.0	S62 58.5
Adhara	255 33.6	S28 56.3
Aldebaran	291 20.1	N16 27.9
Alioth	166 44.9	N56 04.9
Alkaid	153 20.6	N49 25.6
Al Na'ir	28 17.2	S47 04.2
Alnilam	276 13.5	S 1 12.9
Alphard	218 22.7	S 8 33.6
Alphecca	126 34.1	N26 47.6
Alpheratz	358 11.0	N28 58.2
Altair	62 34.4	N 8 48.8
Ankaa	353 41.8	S42 25.5
Antares	112 59.5	S26 22.9
Arcturus	146 20.6	N19 18.1
Atria	108 25.8	S68 59.4
Avior	234 29.1	S59 26.1
Bellatrix	279 00.7	N 6 19.8
Betelgeuse	271 30.3	N 7 24.2
Canopus	264 08.0	S52 40.8
Capella	281 14.0	N45 58.4
Deneb	49 49.6	N45 12.4
Denebola	183 01.4	N14 41.8
Diphda	349 22.6	S18 06.4
Dubhe	194 25.2	N61 52.1
Elnath	278 46.5	N28 35.2
Eltanin	90 58.8	N51 29.9
Enif	34 13.3	N 9 46.6
Fomalhaut	15 53.3	S29 44.3
Gacrux	172 31.4	S56 59.2
Gienah	176 20.3	S17 25.0
Hadar	149 26.7	S60 15.9
Hamal	328 30.8	N23 21.5
Kaus Aust.	84 19.6	S34 23.7
Kochab	137 20.1	N74 15.0
Markab	14 04.9	N15 05.4
Menkar	314 42.9	N 4 00.2
Menkent	148 39.7	S36 15.6
Miaplacidus	221 45.7	S69 37.3
Mirfak	309 18.5	N49 46.9
Nunki	76 31.7	S26 19.4
Peacock	54 01.4	S56 48.5
Pollux	244 00.6	N28 04.7
Procyon	245 27.9	N 5 16.9
Rasalhague	96 31.6	N12 34.8
Regulus	208 12.3	N12 04.6
Rigel	281 37.8	S 8 13.5
Rigil Kent.	140 29.0	S60 44.6
Sabik	102 43.6	S15 41.7
Schedar	350 10.6	N56 25.1
Shaula	96 58.6	S37 05.3
Sirius	258 57.4	S16 41.0
Spica	159 00.0	S11 02.6
Suhail	223 12.4	S43 20.4
Vega	80 57.3	N38 46.2
Zuben'ubi	137 35.5	S15 56.8

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	186 19.4	10 17
Mars	245 23.8	6 20
Jupiter	263 39.1	5 07
Saturn	210 05.5	8 40

G.M.T.	SUN G.H.A.	SUN Dec.	MOON G.H.A.	MOON v	MOON Dec.	MOON d	MOON H.P.
d h	° ′	° ′	° ′	′	° ′	′	′
10 00	183 12.6	S 6 31.0	218 12.6	11.6	N 5 01.0	10.1	57.4
01	198 12.8	31.9	232 43.2	11.5	4 50.9	10.2	57.4
02	213 13.0	32.9	247 13.7	11.6	4 40.7	10.3	57.5
03	228 13.1	· · 33.8	261 44.3	11.5	4 30.4	10.2	57.5
04	243 13.3	34.7	276 14.8	11.4	4 20.2	10.3	57.5
05	258 13.5	35.7	290 45.2	11.5	4 09.9	10.4	57.6
06	273 13.6	S 6 36.6	305 15.7	11.4	N 3 59.5	10.4	57.6
07	288 13.8	37.6	319 46.1	11.4	3 49.1	10.4	57.6
08	303 14.0	38.5	334 16.5	11.3	3 38.7	10.4	57.7
M 09	318 14.1	· · 39.5	348 46.8	11.4	3 28.3	10.5	57.7
O 10	333 14.3	40.4	3 17.2	11.3	3 17.8	10.5	57.7
N 11	348 14.5	41.4	17 47.5	11.3	3 07.3	10.5	57.8
D 12	3 14.6	S 6 42.3	32 17.8	11.2	N 2 56.8	10.6	57.8
A 13	18 14.8	43.3	46 48.0	11.2	2 46.2	10.6	57.8
Y 14	33 15.0	44.2	61 18.2	11.2	2 35.6	10.6	57.9
15	48 15.1	· · 45.2	75 48.4	11.2	2 25.0	10.6	57.9
16	63 15.3	46.1	90 18.6	11.1	2 14.4	10.7	58.0
17	78 15.5	47.1	104 48.7	11.1	2 03.7	10.7	58.0
18	93 15.6	S 6 48.0	119 18.8	11.0	N 1 53.0	10.7	58.0
19	108 15.8	49.0	133 48.8	11.0	1 42.3	10.8	58.1
20	123 15.9	49.9	148 18.8	11.0	1 31.5	10.7	58.1
21	138 16.1	· · 50.8	162 48.8	11.0	1 20.8	10.8	58.1
22	153 16.3	51.8	177 18.8	10.9	1 10.0	10.8	58.2
23	168 16.4	52.7	191 48.7	10.9	0 59.2	10.8	58.2
11 00	183 16.6	S 6 53.7	206 18.6	10.8	N 0 48.4	10.8	58.2
01	198 16.7	54.6	220 48.4	10.8	0 37.6	10.9	58.3
02	213 16.9	55.6	235 18.2	10.8	0 26.7	10.9	58.3
03	228 17.1	· · 56.5	249 48.0	10.7	0 15.8	10.8	58.3
04	243 17.2	57.4	264 17.7	10.7	N 0 05.0	10.9	58.4
05	258 17.4	58.4	278 47.4	10.7	S 0 05.9	10.9	58.4
06	273 17.5	S 6 59.3	293 17.1	10.6	S 0 16.8	11.0	58.4
07	288 17.7	7 00.3	307 46.7	10.6	0 27.8	10.9	58.4
08	303 17.9	01.2	322 16.3	10.5	0 38.7	10.9	58.5
T 09	318 18.0	· · 02.2	336 45.8	10.5	0 49.6	11.0	58.5
U 10	333 18.2	03.1	351 15.3	10.5	1 00.6	10.9	58.5
E 11	348 18.3	04.1	5 44.8	10.4	1 11.5	11.0	58.6
S 12	3 18.5	S 7 05.0	20 14.2	10.4	S 1 22.5	10.9	58.6
D 13	18 18.7	05.9	34 43.6	10.3	1 33.4	11.0	58.6
A 14	33 18.8	06.9	49 12.9	10.3	1 44.4	11.0	58.7
Y 15	48 19.0	· · 07.8	63 42.2	10.2	1 55.4	10.9	58.7
16	63 19.1	08.8	78 11.4	10.2	2 06.3	11.0	58.7
17	78 19.3	09.7	92 40.6	10.2	2 17.3	11.0	58.8
18	93 19.4	S 7 10.7	107 09.8	10.1	S 2 28.3	10.9	58.8
19	108 19.6	11.6	121 38.9	10.1	2 39.2	11.0	58.8
20	123 19.8	12.5	136 08.0	10.0	2 50.2	10.9	58.8
21	138 19.9	· · 13.5	150 37.0	10.0	3 01.1	11.0	58.9
22	153 20.1	14.4	165 06.0	9.9	3 12.1	10.9	58.9
23	168 20.2	15.4	179 34.9	9.9	3 23.0	11.0	58.9
12 00	183 20.4	S 7 16.3	194 03.8	9.9	S 3 34.0	10.9	59.0
01	198 20.5	17.2	208 32.7	9.7	3 44.9	10.9	59.0
02	213 20.7	18.2	223 01.4	9.8	3 55.8	10.9	59.0
03	228 20.9	· · 19.1	237 30.2	9.7	4 06.7	10.9	59.1
04	243 21.0	20.1	251 58.9	9.6	4 17.6	10.9	59.1
05	258 21.2	21.0	266 27.5	9.6	4 28.5	10.8	59.1
06	273 21.3	S 7 21.9	280 56.1	9.6	S 4 39.3	10.9	59.1
07	288 21.5	22.9	295 24.7	9.5	4 50.2	10.8	59.2
W 08	303 21.6	23.8	309 53.2	9.4	5 01.0	10.8	59.2
E 09	318 21.8	· · 24.8	324 21.6	9.4	5 11.8	10.8	59.2
D 10	333 21.9	25.7	338 50.0	9.4	5 22.6	10.7	59.2
N 11	348 22.1	26.6	353 18.4	9.3	5 33.3	10.8	59.3
E 12	3 22.3	S 7 27.6	7 46.7	9.2	S 5 44.1	10.7	59.3
S 13	18 22.4	28.5	22 14.9	9.2	5 54.8	10.7	59.3
D 14	33 22.6	29.5	36 43.1	9.2	6 05.5	10.7	59.3
A 15	48 22.7	· · 30.4	51 11.3	9.0	6 16.2	10.6	59.4
Y 16	63 22.9	31.3	65 39.3	9.1	6 26.8	10.6	59.4
17	78 23.0	32.3	80 07.4	9.0	6 37.4	10.6	59.4
18	93 23.2	S 7 33.2					
19	108 23.3	34.1					
20	123 23.5	35.1					
21	138 23.6	· · 36.0					
22	153 23.8	37.0					
23	168 23.9	37.9					
	S.D. 16.0	d 0.9	S.D. 15.8		16.0		16.2

A Total Eclipse of the Sun occurs on this date. See page 5.

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 10	Moonrise 11	Moonrise 12	Moonrise 13
°	h m	h m	h m	h m	h m	h m	h m
N 72	04 37	05 55	07 04	02 37	04 25	06 18	08 15
N 70	04 43	05 53	06 55	02 44	04 25	06 11	08 00
68	04 47	05 52	06 48	02 49	04 25	06 05	07 47
66	04 51	05 51	06 42	02 53	04 25	06 00	07 37
64	04 54	05 49	06 37	02 57	04 25	05 56	07 29
62	04 57	05 48	06 33	03 00	04 25	05 52	07 22
60	04 59	05 47	06 29	03 03	04 25	05 49	07 16
N 58	05 01	05 46	06 26	03 05	04 25	05 47	07 10
56	05 02	05 45	06 23	03 08	04 25	05 44	07 06
54	05 04	05 44	06 20	03 09	04 25	05 42	07 01
52	05 05	05 44	06 17	03 11	04 25	05 40	06 58
50	05 05	05 43	06 15	03 13	04 24	05 38	06 54
45	05 07	05 41	06 10	03 16	04 24	05 35	06 47
N 40	05 08	05 39	06 06	03 19	04 24	05 31	06 40
35	05 08	05 37	06 02	03 22	04 24	05 29	06 35
30	05 07	05 35	05 59	03 24	04 24	05 26	06 30
20	05 06	05 31	05 53	03 28	04 24	05 22	06 22
N 10	05 03	05 27	05 48	03 31	04 24	05 19	06 15
0	04 58	05 23	05 43	03 35	04 24	05 15	06 08
S 10	04 53	05 17	05 38	03 38	04 24	05 12	06 02
20	04 45	05 11	05 33	03 41	04 24	05 09	05 55
30	04 34	05 03	05 27	03 45	04 24	05 05	05 47
35	04 27	04 57	05 23	03 48	04 24	05 02	05 43
40	04 19	04 51	05 19	03 50	04 24	05 00	05 38
45	04 08	04 44	05 14	03 53	04 24	04 57	05 32
S 50	03 54	04 35	05 08	03 57	04 25	04 54	05 25
52	03 48	04 30	05 05	03 58	04 25	04 52	05 22
54	03 40	04 26	05 02	04 00	04 25	04 50	05 18
56	03 32	04 20	04 59	04 02	04 25	04 48	05 14
58	03 22	04 14	04 55	04 04	04 25	04 46	05 10
S 60	03 11	04 07	04 51	04 06	04 25	04 44	05 05

Lat.	Sunset	Twilight Civil	Twilight Naut.	Moonset 10	Moonset 11	Moonset 12	Moonset 13
°	h m	h m	h m	h m	h m	h m	h m
N 72	16 28	17 36	18 54	16 25	16 19	16 14	16 08
N 70	16 36	17 38	18 48	16 22	16 22	16 23	16 25
68	16 44	17 40	18 44	16 20	16 25	16 31	16 39
66	16 50	17 41	18 40	16 18	16 27	16 37	16 50
64	16 55	17 43	18 37	16 16	16 29	16 43	16 59
62	16 59	17 44	18 35	16 15	16 30	16 48	17 07
60	17 03	17 45	18 33	16 13	16 32	16 52	17 14
N 58	17 07	17 46	18 31	16 12	16 33	16 55	17 21
56	17 10	17 47	18 30	16 11	16 34	16 59	17 26
54	17 13	17 48	18 29	16 10	16 35	17 02	17 31
52	17 15	17 49	18 28	16 10	16 36	17 04	17 36
50	17 18	17 50	18 27	16 09	16 37	17 07	17 40
45	17 23	17 52	18 26	16 07	16 39	17 12	17 49
N 40	17 27	17 54	18 25	16 06	16 40	17 17	17 56
35	17 31	17 56	18 25	16 04	16 42	17 21	18 02
30	17 34	17 58	18 26	16 03	16 43	17 24	18 08
20	17 40	18 02	18 28	16 01	16 45	17 30	18 18
N 10	17 45	18 06	18 31	16 00	16 47	17 35	18 26
0	17 50	18 11	18 35	15 58	16 48	17 40	18 35
S 10	17 55	18 16	18 41	15 57	16 50	17 45	18 43
20	18 01	18 23	18 49	15 55	16 52	17 51	18 51
30	18 07	18 32	19 00	15 53	16 54	17 57	19 01
35	18 11	18 37	19 07	15 51	16 55	18 00	19 07
40	18 15	18 43	19 16	15 50	16 56	18 04	19 13
45	18 20	18 51	19 27	15 49	16 58	18 09	19 21
S 50	18 27	19 00	19 41	15 47	16 59	18 14	19 30
52	18 29	19 04	19 47	15 46	17 00	18 17	19 34
54	18 32	19 09	19 55	15 45	17 01	18 19	19 39
56	18 36	19 15	20 04	15 44	17 02	18 22	19 44
58	18 40	19 21	20 14	15 42	17 03	18 26	19 50
S 60	18 44	19 28	20 25	15 41	17 04	18 30	19 56

Day	SUN Eqn. of Time 00ʰ	SUN Eqn. of Time 12ʰ	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
	m s	m s	h m	h m	h m	d	
10	12 50	12 58	11 47	09 46	22 11	27	●
11	13 06	13 14	11 47	10 36	23 02	28	
12	13 21	13 29	11 47	11 28	23 54	29	

1977 OCTOBER 13, 14, 15 (THURS., FRI., SAT.)

	G.M.T.	ARIES	VENUS −3.4		MARS +0.7		JUPITER −2.0		SATURN +0.8	
		G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
	d h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
	13 00	21 26.4	205 28.7	N 3 20.2	265 46.1	N22 16.7	285 00.2	N22 56.5	231 20.7	N13 24.6
	01	36 28.9	220 28.3	19.0	280 47.3	16.5	300 02.6	56.5	246 22.9	24.5
	02	51 31.3	235 27.9	17.8	295 48.4	16.4	315 04.9	56.5	261 25.1	24.4
	03	66 33.8	250 27.5	· · 16.6	310 49.5	· · 16.2	330 07.3	· · 56.5	276 27.4	· · 24.4
	04	81 36.3	265 27.2	15.4	325 50.7	16.1	345 09.7	56.5	291 29.6	24.3
	05	96 38.7	280 26.8	14.2	340 51.8	15.9	0 12.0	56.5	306 31.8	24.2
	06	111 41.2	295 26.4	N 3 13.0	355 53.0	N22 15.8	15 14.4	N22 56.5	321 34.1	N13 24.1
	07	126 43.7	310 26.0	11.9	10 54.1	15.6	30 16.8	56.5	336 36.3	24.1
T	08	141 46.1	325 25.6	10.7	25 55.3	15.5	45 19.1	56.5	351 38.5	24.0
H	09	156 48.6	340 25.2	· · 09.5	40 56.4	· · 15.3	60 21.5	· · 56.5	6 40.8	· · 23.9
U	10	171 51.1	355 24.8	08.3	55 57.5	15.2	75 23.8	56.4	21 43.0	23.8
R	11	186 53.5	10 24.4	07.1	70 58.7	15.0	90 26.2	56.4	36 45.2	23.8
S	12	201 56.0	25 24.0	N 3 05.9	85 59.8	N22 14.9	105 28.6	N22 56.4	51 47.5	N13 23.7
D	13	216 58.4	40 23.6	04.7	101 01.0	14.7	120 30.9	56.4	66 49.7	23.6
A	14	232 00.9	55 23.3	03.5	116 02.1	14.6	135 33.3	56.4	81 52.0	23.5
Y	15	247 03.4	70 22.9	· · 02.3	131 03.3	· · 14.4	150 35.7	· · 56.4	96 54.2	· · 23.5
	16	262 05.8	85 22.5	01.2	146 04.4	14.3	165 38.0	56.4	111 56.4	23.4
	17	277 08.3	100 22.1	3 00.0	161 05.6	14.1	180 40.4	56.4	126 58.7	23.3
	18	292 10.8	115 21.7	N 2 58.8	176 06.7	N22 14.0	195 42.8	N22 56.4	142 00.9	N13 23.2
	19	307 13.2	130 21.3	57.6	191 07.9	13.8	210 45.2	56.4	157 03.1	23.2
	20	322 15.7	145 20.9	56.4	206 09.0	13.7	225 47.5	56.4	172 05.4	23.1
	21	337 18.2	160 20.5	· · 55.2	221 10.2	· · 13.5	240 49.9	· · 56.4	187 07.6	· · 23.0
	22	352 20.6	175 20.1	54.0	236 11.3	13.4	255 52.3	56.4	202 09.8	23.0
	23	7 23.1	190 19.7	52.8	251 12.5	13.2	270 54.6	56.4	217 12.1	22.9
	14 00	22 25.6	205 19.4	N 2 51.6	266 13.6	N22 13.1	285 57.0	N22 56.4	232 14.3	N13 22.8
	01	37 28.0	220 19.0	50.4	281 14.8	12.9	300 59.4	56.4	247 16.5	22.7
	02	52 30.5	235 18.6	49.2	296 15.9	12.8	316 01.7	56.4	262 18.8	22.7
	03	67 32.9	250 18.2	· · 48.0	311 17.1	· · 12.6	331 04.1	· · 56.4	277 21.0	· · 22.6
	04	82 35.4	265 17.8	46.9	326 18.2	12.5	346 06.5	56.4	292 23.3	22.5
	05	97 37.9	280 17.4	45.7	341 19.4	12.3	1 08.9	56.4	307 25.5	22.4
	06	112 40.3	295 17.0	N 2 44.5	356 20.5	N22 12.2	16 11.2	N22 56.4	322 27.7	N13 22.4
	07	127 42.8	310 16.6	43.3	11 21.7	12.0	31 13.6	56.4	337 30.0	22.3
	08	142 45.3	325 16.2	42.1	26 22.9	11.9	46 16.0	56.4	352 32.2	22.2
F	09	157 47.7	340 15.9	· · 40.9	41 24.0	· · 11.7	61 18.4	· · 56.4	7 34.4	· · 22.1
R	10	172 50.2	355 15.5	39.7	56 25.2	11.6	76 20.7	56.4	22 36.7	22.1
I	11	187 52.7	10 15.1	38.5	71 26.3	11.4	91 23.1	56.4	37 38.9	22.0
D	12	202 55.1	25 14.7	N 2 37.3	86 27.5	N22 11.2	106 25.5	N22 56.4	52 41.2	N13 21.9
A	13	217 57.6	40 14.3	36.1	101 28.6	11.1	121 27.9	56.4	67 43.4	21.8
Y	14	233 00.0	55 13.9	34.9	116 29.8	10.9	136 30.2	56.4	82 45.6	21.8
	15	248 02.5	70 13.5	· · 33.7	131 31.0	· · 10.8	151 32.6	· · 56.4	97 47.9	· · 21.7
	16	263 05.0	85 13.1	32.5	146 32.1	10.6	166 35.0	56.4	112 50.1	21.6
	17	278 07.4	100 12.7	31.3	161 33.3	10.5	181 37.4	56.4	127 52.3	21.6
	18	293 09.9	115 12.4	N 2 30.1	176 34.4	N22 10.3	196 39.7	N22 56.4	142 54.6	N13 21.5
	19	308 12.4	130 12.0	28.9	191 35.6	10.2	211 42.1	56.4	157 56.8	21.4
	20	323 14.8	145 11.6	27.7	206 36.8	10.0	226 44.5	56.4	172 59.1	21.3
	21	338 17.3	160 11.2	· · 26.6	221 37.9	· · 09.9	241 46.9	· · 56.4	188 01.3	· · 21.3
	22	353 19.8	175 10.8	25.4	236 39.1	09.7	256 49.3	56.4	203 03.5	21.2
	23	8 22.2	190 10.4	24.2	251 40.3	09.6	271 51.6	56.4	218 05.8	21.1
	15 00	23 24.7	205 10.0	N 2 23.0	266 41.4	N22 09.4	286 54.0	N22 56.4	233 08.0	N13 21.0
	01	38 27.2	220 09.6	21.8	281 42.6	09.3	301 56.4	56.4	248 10.3	21.0
	02	53 29.6	235 09.2	20.6	296 43.8	09.1	316 58.8	56.4	263 12.5	20.9
	03	68 32.1	250 08.9	· · 19.4	311 44.9	· · 08.9	332 01.2	· · 56.4	278 14.7	· · 20.8
	04	83 34.5	265 08.5	18.2	326 46.1	08.8	347 03.5	56.4	293 17.0	20.8
	05	98 37.0	280 08.1	17.0	341 47.3	08.6	2 05.9	56.4	308 19.2	20.7
	06	113 39.5	295 07.7	N 2 15.8	356 48.4	N22 08.5	17 08.3	N22 56.4	323 21.5	N13 20.6
	07	128 41.9	310 07.3	14.6	11 49.6	08.3	32 10.7	56.4	338 23.7	20.5
S	08	143 44.4	325 06.9	13.4	26 50.8	08.2	47 13.1	56.4	353 25.9	20.5
A	09	158 46.9	340 06.5	· · 12.2	41 51.9	· · 08.0	62 15.4	· · 56.4	8 28.2	· · 20.4
T	10	173 49.3	355 06.1	11.0	56 53.1	07.9	77 17.8	56.4	23 30.4	20.3
U	11	188 51.8	10 05.8	09.8	71 54.3	07.7	92 20.2	56.4	38 32.7	20.2
R	12	203 54.3	25 05.4	N 2 08.6	86 55.4	N22 07.6	107 22.6	N22 56.4	53 34.9	N13 20.2
D	13	218 56.7	40 05.0	07.4	101 56.6	07.4	122 25.0	56.4	68 37.1	20.1
A	14	233 59.2	55 04.6	06.2	116 57.8	07.3	137 27.4	56.4	83 39.4	20.0
Y	15	249 01.7	70 04.2	· · 05.0	131 59.0	· · 07.1	152 29.8	· · 56.4	98 41.6	· · 20.0
	16	264 04.1	85 03.8	03.8	147 00.1	07.0	167 32.1	56.4	113 43.9	19.9
	17	279 06.6	100 03.4	02.6	162 01.3	06.8	182 34.5	56.4	128 46.1	19.8
	18	294 09.0	115 03.0	N 2 01.4	177 02.5	N22 06.6	197 36.9	N22 56.4	143 48.3	N13 19.7
	19	309 11.5	130 02.7	2 00.2	192 03.7	06.5	212 39.3	56.4	158 50.6	19.7
	20	324 14.0	145 02.3	1 59.0	207 04.8	06.3	227 41.7	56.4	173 52.8	19.6
	21	339 16.4	160 01.9	· · 57.8	222 06.0	· · 06.2	242 44.1	· · 56.4	188 55.1	· · 19.5
	22	354 18.9	175 01.5	56.6	237 07.2	06.0	257 46.5	56.4	203 57.3	19.4
	23	9 21.4	190 01.1	55.4	252 08.4	05.9	272 48.8	56.4	218 59.5	19.4
	Mer. Pass.	h m 22 26.6	v 0.4	d 1.2	v 1.2	d 0.2	v 2.4	d 0.0	v 2.2	d 0.1

STARS

Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 38.4	S40 23.5
Achernar	335 46.2	S57 20.9
Acrux	173 40.0	S62 58.4
Adhara	255 33.6	S28 56.3
Aldebaran	291 20.0	N16 27.9
Alioth	166 44.9	N56 04.8
Alkaid	153 20.6	N49 25.6
Al Na'ir	28 17.2	S47 04.2
Alnilam	276 13.5	S 1 12.9
Alphard	218 22.7	S 8 33.6
Alphecca	126 34.1	N26 47.6
Alpheratz	358 11.0	N28 58.3
Altair	62 34.4	N 8 48.8
Ankaa	353 41.8	S42 25.6
Antares	112 59.5	S26 22.9
Arcturus	146 20.6	N19 18.1
Atria	108 25.9	S68 59.4
Avior	234 29.1	S59 26.1
Bellatrix	279 00.7	N 6 19.8
Betelgeuse	271 30.3	N 7 24.2
Canopus	264 07.9	S52 40.8
Capella	281 14.0	N45 58.4
Deneb	49 49.6	N45 12.5
Denebola	183 01.4	N14 41.8
Diphda	349 22.6	S18 06.4
Dubhe	194 25.2	N61 52.1
Elnath	278 46.5	N28 35.2
Eltanin	90 58.9	N51 29.9
Enif	34 13.4	N 9 46.6
Fomalhaut	15 53.4	S29 44.3
Gacrux	172 31.4	S56 59.2
Gienah	176 20.3	S17 25.0
Hadar	149 26.7	S60 15.9
Hamal	328 30.8	N23 21.5
Kaus Aust.	84 19.6	S34 23.7
Kochab	137 20.2	N74 15.0
Markab	14 04.9	N15 05.4
Menkar	314 42.9	N 4 00.2
Menkent	148 39.7	S36 15.6
Miaplacidus	221 45.6	S69 37.3
Mirfak	309 18.5	N49 46.9
Nunki	76 31.7	S26 19.4
Peacock	54 01.4	S56 48.5
Pollux	244 00.6	N28 04.7
Procyon	245 27.9	N 5 16.9
Rasalhague	96 31.6	N12 34.8
Regulus	208 12.3	N12 04.6
Rigel	281 37.7	S 8 13.6
Rigil Kent.	140 29.1	S60 44.5
Sabik	102 43.6	S15 41.7
Schedar	350 10.6	N56 25.1
Shaula	96 58.7	S37 05.3
Sirius	258 57.4	S16 41.1
Spica	159 00.0	S11 02.6
Suhail	223 12.4	S43 20.4
Vega	80 57.3	N38 46.2
Zuben'ubi	137 35.5	S15 56.8

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	182 53.8	10 19
Mars	243 48.1	6 15
Jupiter	263 31.5	4 55
Saturn	209 48.8	8 30

G.M.T.			SUN		MOON				
			G.H.A.	Dec.	G.H.A.	*v*	Dec.	*d*	H.P.
d		h	° ′	° ′	° ′	′	° ′	′	′
13		00	183 24.1	S 7 38.8	181 22.2	8.6	S 7 50.7	10.3	59.6
		01	198 24.2	39.8	195 49.8	8.5	8 01.0	10.3	59.6
		02	213 24.4	40.7	210 17.3	8.5	8 11.3	10.2	59.6
		03	228 24.5	·· 41.6	224 44.8	8.5	8 21.5	10.2	59.6
		04	243 24.7	42.6	239 12.3	8.4	8 31.7	10.2	59.7
		05	258 24.8	43.5	253 39.7	8.3	8 41.9	10.1	59.7
		06	273 25.0	S 7 44.4	268 07.0	8.3	S 8 52.0	10.0	59.7
		07	288 25.1	45.4	282 34.3	8.2	9 02.0	10.0	59.7
	T	08	303 25.3	46.3	297 01.5	8.2	9 12.0	10.0	59.7
	H	09	318 25.4	·· 47.3	311 28.7	8.1	9 22.0	9.9	59.8
	U	10	333 25.6	48.2	325 55.8	8.1	9 31.9	9.8	59.8
	R	11	348 25.7	49.1	340 22.9	8.0	9 41.7	9.8	59.8
	S	12	3 25.9	S 7 50.1	354 49.9	8.0	S 9 51.5	9.7	59.8
	D	13	18 26.0	51.0	9 16.9	7.9	10 01.2	9.7	59.8
	A	14	33 26.2	51.9	23 43.8	7.8	10 10.9	9.6	59.8
	Y	15	48 26.3	·· 52.9	38 10.6	7.8	10 20.5	9.6	59.9
		16	63 26.5	53.8	52 37.4	7.7	10 30.1	9.5	59.9
		17	78 26.6	54.7	67 04.1	7.7	10 39.6	9.4	59.9
		18	93 26.8	S 7 55.7	81 30.8	7.6	S10 49.0	9.4	59.9
		19	108 26.9	56.6	95 57.4	7.6	10 58.4	9.3	59.9
		20	123 27.1	57.5	110 24.0	7.5	11 07.7	9.2	59.9
		21	138 27.2	·· 58.5	124 50.5	7.5	11 16.9	9.2	60.0
		22	153 27.4	7 59.4	139 17.0	7.4	11 26.1	9.1	60.0
		23	168 27.5	8 00.3	153 43.4	7.4	11 35.2	9.0	60.0
14		00	183 27.7	S 8 01.3	168 09.8	7.3	S11 44.2	9.0	60.0
		01	198 27.8	02.2	182 36.1	7.2	11 53.2	8.8	60.0
		02	213 27.9	03.1	197 02.3	7.2	12 02.0	8.9	60.0
		03	228 28.1	·· 04.0	211 28.5	7.2	12 10.9	8.7	60.0
		04	243 28.2	05.0	225 54.7	7.1	12 19.6	8.6	60.0
		05	258 28.4	05.9	240 20.8	7.0	12 28.2	8.6	60.1
		06	273 28.5	S 8 06.8	254 46.8	7.0	S12 36.8	8.5	60.1
		07	288 28.7	07.8	269 12.8	6.9	12 45.3	8.4	60.1
		08	303 28.8	08.7	283 38.7	6.9	12 53.7	8.4	60.1
	F	09	318 29.0	·· 09.6	298 04.6	6.9	13 02.1	8.2	60.1
	R	10	333 29.1	10.6	312 30.5	6.7	13 10.3	8.2	60.1
	I	11	348 29.2	11.5	326 56.2	6.8	13 18.5	8.1	60.1
	D	12	3 29.4	S 8 12.4	341 22.0	6.7	S13 26.6	7.9	60.1
	A	13	18 29.5	13.4	355 47.7	6.6	13 34.5	8.0	60.1
	Y	14	33 29.7	14.3	10 13.3	6.6	13 42.5	7.8	60.1
		15	48 29.8	·· 15.2	24 38.9	6.5	13 50.3	7.7	60.1
		16	63 30.0	16.1	39 04.4	6.5	13 58.0	7.6	60.1
		17	78 30.1	17.1	53 29.9	6.5	14 05.6	7.6	60.2
		18	93 30.2	S 8 18.0	67 55.4	6.4	S14 13.2	7.4	60.2
		19	108 30.4	18.9	82 20.8	6.3	14 20.6	7.4	60.2
		20	123 30.5	19.9	96 46.1	6.4	14 28.0	7.2	60.2
		21	138 30.7	·· 20.8	111 11.5	6.2	14 35.2	7.2	60.2
		22	153 30.8	21.7	125 36.7	6.2	14 42.4	7.0	60.2
		23	168 31.0	22.6	140 01.9	6.2	14 49.4	7.0	60.2
15		00	183 31.1	S 8 23.6	154 27.1	6.2	S14 56.4	6.8	60.2
		01	198 31.2	24.5	168 52.3	6.1	15 03.2	6.8	60.2
		02	213 31.4	25.4	183 17.4	6.0	15 10.0	6.7	60.2
		03	228 31.5	·· 26.3	197 42.4	6.1	15 16.7	6.5	60.2
		04	243 31.7	27.3	212 07.5	5.9	15 23.2	6.5	60.2
		05	258 31.8	28.2	226 32.4	6.0	15 29.7	6.3	60.2
		06	273 31.9	S 8 29.1	240 57.4	5.9	S15 36.0	6.2	60.2
		07	288 32.1	30.0	255 22.3	5.9	15 42.2	6.2	60.2
	S	08	303 32.2	31.0	269 47.2	5.8	15 48.4	6.0	60.2
	A	09	318 32.3	·· 31.9	284 12.0	5.8	15 54.4	5.9	60.2
	T	10	333 32.5	32.8	298 36.8	5.8	16 00.3	5.8	60.2
	U	11	348 32.6	33.7	313 01.6	5.7	16 06.1	5.7	60.2
	R	12	3 32.8	S 8 34.7	327 26.3	5.7	S16 11.8	5.6	60.2
	D	13	18 32.9	35.6	341 51.0	5.7	16 17.4	5.4	60.2
	A	14	33 33.0	36.5	356 15.7	5.6	16 22.8	5.4	60.2
	Y	15	48 33.2	·· 37.4	10 40.3	5.6	16 28.2	5.2	60.2
		16	63 33.3	38.4	25 04.9	5.6	16 33.4	5.1	60.2
		17	78 33.4	39.3	39 29.5	5.5	16 38.5	5.1	60.2
		18	93 33.6	S 8 40.2	53 54.0	5.6	S16 43.6	4.9	60.2
		19	108 33.7	41.1	68 18.6	5.5	16 48.5	4.7	60.2
		20	123 33.9	42.1	82 43.1	5.5	16 53.2	4.7	60.2
		21	138 34.0	·· 43.0	97 07.6	5.4	16 57.9	4.5	60.2
		22	153 34.1	43.9	111 32.0	5.5	17 02.4	4.4	60.2
		23	168 34.3	44.8	125 56.5	5.4	17 06.8	4.4	60.2
			S.D. 16.1	*d* 0.9	S.D.	16.3	16.4		16.4

Lat.	Twilight		Sunrise	Moonrise			
	Naut.	Civil		13	14	15	16
°	h m	h m	h m	h m	h m	h m	h m
N 72	04 50	06 08	07 18	08 15	10 19	12 32	▬
N 70	04 55	06 05	07 08	08 00	09 52	11 44	13 27
68	04 58	06 02	06 59	07 47	09 32	11 14	12 45
66	05 01	06 00	06 52	07 37	09 16	10 51	12 16
64	05 03	05 58	06 46	07 29	09 03	10 33	11 55
62	05 05	05 56	06 41	07 22	08 52	10 19	11 37
60	05 06	05 54	06 36	07 16	08 43	10 07	11 23
N 58	05 07	05 53	06 32	07 10	08 35	09 56	11 11
56	05 08	05 51	06 29	07 06	08 28	09 47	11 00
54	05 09	05 50	06 26	07 01	08 21	09 39	10 51
52	05 10	05 49	06 23	06 58	08 15	09 31	10 43
50	05 10	05 47	06 20	06 54	08 10	09 25	10 35
45	05 11	05 45	06 14	06 47	07 59	09 11	10 19
N 40	05 11	05 42	06 09	06 40	07 50	08 59	10 06
35	05 10	05 39	06 05	06 35	07 42	08 50	09 55
30	05 09	05 37	06 01	06 30	07 36	08 41	09 45
20	05 07	05 32	05 54	06 22	07 24	08 26	09 29
N 10	05 03	05 27	05 48	06 15	07 14	08 14	09 14
0	04 58	05 22	05 43	06 08	07 04	08 02	09 01
S 10	04 51	05 16	05 37	06 02	06 54	07 50	08 47
20	04 42	05 08	05 31	05 55	06 44	07 37	08 33
30	04 30	04 59	05 23	05 47	06 33	07 23	08 17
35	04 23	04 53	05 19	05 43	06 26	07 14	08 07
40	04 13	04 47	05 14	05 38	06 19	07 05	07 56
45	04 02	04 38	05 09	05 32	06 10	06 54	07 44
S 50	03 47	04 28	05 02	05 25	06 00	06 41	07 28
52	03 40	04 23	04 59	05 22	05 55	06 35	07 21
54	03 32	04 18	04 55	05 18	05 50	06 28	07 13
56	03 23	04 12	04 51	05 14	05 44	06 20	07 04
58	03 12	04 05	04 47	05 10	05 38	06 12	06 54
S 60	02 59	03 57	04 42	05 05	05 31	06 02	06 43

Lat.	Sunset	Twilight		Moonset			
		Civil	Naut.	13	14	15	16
°	h m	h m	h m	h m	h m	h m	h m
N 72	16 12	17 22	18 39	16 08	16 01	15 49	▬
N 70	16 22	17 25	18 35	16 25	16 29	16 37	16 59
68	16 31	17 28	18 32	16 39	16 50	17 09	17 41
66	16 38	17 30	18 29	16 50	17 07	17 32	18 10
64	16 45	17 33	18 27	16 59	17 21	17 50	18 32
62	16 50	17 35	18 26	17 07	17 32	18 05	18 49
60	16 55	17 37	18 25	17 14	17 42	18 18	19 04
N 58	16 59	17 38	18 23	17 21	17 51	18 29	19 16
56	17 02	17 40	18 23	17 26	17 59	18 38	19 27
54	17 06	17 41	18 22	17 31	18 06	18 47	19 37
52	17 09	17 43	18 22	17 36	18 12	18 54	19 45
50	17 11	17 44	18 21	17 40	18 17	19 01	19 53
45	17 17	17 47	18 21	17 49	18 29	19 16	20 09
N 40	17 22	17 50	18 21	17 56	18 40	19 28	20 22
35	17 27	17 52	18 21	18 02	18 48	19 38	20 33
30	17 31	17 55	18 22	18 08	18 56	19 48	20 43
20	17 37	18 00	18 25	18 18	19 09	20 03	21 00
N 10	17 44	18 05	18 29	18 26	19 20	20 17	21 15
0	17 49	18 10	18 34	18 35	19 31	20 30	21 29
S 10	17 55	18 17	18 41	18 43	19 42	20 42	21 43
20	18 02	18 24	18 50	18 51	19 53	20 56	21 58
30	18 09	18 34	19 02	19 01	20 07	21 12	22 15
35	18 14	18 39	19 10	19 07	20 14	21 21	22 25
40	18 19	18 46	19 20	19 13	20 23	21 31	22 36
45	18 24	18 55	19 31	19 21	20 33	21 43	22 49
S 50	18 31	19 05	19 46	19 30	20 46	21 58	23 05
52	18 35	19 10	19 54	19 34	20 51	22 05	23 13
54	18 38	19 16	20 02	19 39	20 58	22 13	23 21
56	18 42	19 22	20 11	19 44	21 05	22 22	23 30
58	18 47	19 29	20 22	19 50	21 13	22 31	23 41
S 60	18 52	19 37	20 36	19 56	21 22	22 43	23 54

Day	SUN			MOON			
	Eqn. of Time		Mer. Pass.	Mer. Pass.		Age	Phase
	00^h	12^h		Upper	Lower		
	m s	m s	h m	h m	h m	d	
13	13 36	13 43	11 46	12 21	24 49	01	●
14	13 50	13 57	11 46	13 17	00 49	02	
15	14 04	14 11	11 46	14 16	01 46	03	

1977 OCTOBER 16, 17, 18 (SUN., MON., TUES.)

	G.M.T.	ARIES G.H.A.	VENUS −3.4 G.H.A.	VENUS Dec	MARS +0.6 G.H.A.	MARS Dec.	JUPITER −2.0 G.H.A.	JUPITER Dec.	SATURN +0.8 G.H.A.	SATURN Dec.
	d h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
	16 00	24 23.8	205 00.7	N 1 54.2	267 09.5	N22 05.7	287 51.2	N22 56.4	234 01.8	N13 19.3
	01	39 26.3	220 00.3	53.0	282 10.7	05.6	302 53.6	56.4	249 04.0	19.2
	02	54 28.8	234 59.9	51.8	297 11.9	05.4	317 56.0	56.4	264 06.3	19.2
	03	69 31.2	249 59.6	· · 50.6	312 13.1	· · 05.3	332 58.4	· · 56.4	279 08.5	· · 19.1
	04	84 33.7	264 59.2	49.4	327 14.3	05.1	348 00.8	56.4	294 10.8	19.0
	05	99 36.1	279 58.8	48.2	342 15.4	04.9	3 03.2	56.4	309 13.0	18.9
	06	114 38.6	294 58.4	N 1 47.0	357 16.6	N22 04.8	18 05.6	N22 56.4	324 15.2	N13 18.9
	07	129 41.1	309 58.0	45.8	12 17.8	04.6	33 08.0	56.4	339 17.5	18.8
	08	144 43.5	324 57.6	44.6	27 19.0	04.5	48 10.4	56.4	354 19.7	18.7
S	09	159 46.0	339 57.2	· · 43.4	42 20.2	· · 04.3	63 12.7	· · 56.4	9 22.0	· · 18.7
U	10	174 48.5	354 56.8	42.2	57 21.3	04.2	78 15.1	56.4	24 24.2	18.6
N	11	189 50.9	9 56.5	41.0	72 22.5	04.0	93 17.5	56.4	39 26.5	18.5
D	12	204 53.4	24 56.1	N 1 39.8	87 23.7	N22 03.9	108 19.9	N22 56.4	54 28.7	N13 18.4
A	13	219 55.9	39 55.7	38.6	102 24.9	03.7	123 22.3	56.4	69 30.9	18.4
Y	14	234 58.3	54 55.3	37.4	117 26.1	03.5	138 24.7	56.4	84 33.2	18.3
	15	250 00.8	69 54.9	· · 36.2	132 27.3	· · 03.4	153 27.1	· · 56.3	99 35.4	· · 18.2
	16	265 03.3	84 54.5	35.0	147 28.4	03.2	168 29.5	56.3	114 37.7	18.2
	17	280 05.7	99 54.1	33.8	162 29.6	03.1	183 31.9	56.3	129 39.9	18.1
	18	295 08.2	114 53.7	N 1 32.6	177 30.8	N22 02.9	198 34.3	N22 56.3	144 42.2	N13 18.0
	19	310 10.6	129 53.4	31.4	192 32.0	02.8	213 36.7	56.3	159 44.4	17.9
	20	325 13.1	144 53.0	30.2	207 33.2	02.6	228 39.1	56.3	174 46.6	17.9
	21	340 15.6	159 52.6	· · 29.0	222 34.4	· · 02.5	243 41.5	· · 56.3	189 48.9	· · 17.8
	22	355 18.0	174 52.2	27.8	237 35.6	02.3	258 43.9	56.3	204 51.1	17.7
	23	10 20.5	189 51.8	26.6	252 36.8	02.1	273 46.3	56.3	219 53.4	17.7
	17 00	25 23.0	204 51.4	N 1 25.3	267 38.0	N22 02.0	288 48.7	N22 56.3	234 55.6	N13 17.6
	01	40 25.4	219 51.0	24.1	282 39.1	01.8	303 51.1	56.3	249 57.9	17.5
	02	55 27.9	234 50.6	22.9	297 40.3	01.7	318 53.5	56.3	265 00.1	17.4
	03	70 30.4	249 50.3	· · 21.7	312 41.5	· · 01.5	333 55.9	· · 56.3	280 02.4	· · 17.4
	04	85 32.8	264 49.9	20.5	327 42.7	01.4	348 58.3	56.3	295 04.6	17.3
	05	100 35.3	279 49.5	19.3	342 43.9	01.2	4 00.7	56.3	310 06.9	17.2
	06	115 37.8	294 49.1	N 1 18.1	357 45.1	N22 01.1	19 03.1	N22 56.3	325 09.1	N13 17.2
	07	130 40.2	309 48.7	16.9	12 46.3	00.9	34 05.5	56.3	340 11.3	17.1
	08	145 42.7	324 48.3	15.7	27 47.5	00.7	49 07.9	56.3	355 13.6	17.0
M	09	160 45.1	339 47.9	· · 14.5	42 48.7	· · 00.6	64 10.3	· · 56.3	10 15.8	· · 17.0
O	10	175 47.6	354 47.5	13.3	57 49.9	00.4	79 12.7	56.3	25 18.1	16.9
N	11	190 50.1	9 47.2	12.1	72 51.1	00.3	94 15.1	56.3	40 20.3	16.8
D	12	205 52.5	24 46.8	N 1 10.9	87 52.3	N22 00.1	109 17.5	N22 56.3	55 22.6	N13 16.7
A	13	220 55.0	39 46.4	09.7	102 53.5	22 00.0	124 19.9	56.3	70 24.8	16.7
Y	14	235 57.5	54 46.0	08.5	117 54.7	21 59.8	139 22.3	56.3	85 27.1	16.6
	15	250 59.9	69 45.6	· · 07.3	132 55.9	· · 59.7	154 24.7	· · 56.3	100 29.3	· · 16.5
	16	266 02.4	84 45.2	06.1	147 57.1	59.5	169 27.1	56.3	115 31.6	16.5
	17	281 04.9	99 44.8	04.9	162 58.3	59.3	184 29.5	56.3	130 33.8	16.4
	18	296 07.3	114 44.5	N 1 03.7	177 59.5	N21 59.2	199 31.9	N22 56.3	145 36.1	N13 16.3
	19	311 09.8	129 44.1	02.5	193 00.7	59.0	214 34.3	56.3	160 38.3	16.2
	20	326 12.2	144 43.7	01.2	208 01.9	58.9	229 36.7	56.3	175 40.5	16.2
	21	341 14.7	159 43.3	1 00.0	223 03.1	· · 58.7	244 39.1	· · 56.3	190 42.8	· · 16.1
	22	356 17.2	174 42.9	0 58.8	238 04.3	58.6	259 41.5	56.3	205 45.0	16.0
	23	11 19.6	189 42.5	57.6	253 05.5	58.4	274 43.9	56.3	220 47.3	16.0
	18 00	26 22.1	204 42.1	N 0 56.4	268 06.7	N21 58.2	289 46.3	N22 56.3	235 49.5	N13 15.9
	01	41 24.6	219 41.7	55.2	283 07.9	58.1	304 48.7	56.3	250 51.8	15.8
	02	56 27.0	234 41.4	54.0	298 09.1	57.9	319 51.1	56.3	265 54.0	15.8
	03	71 29.5	249 41.0	· · 52.8	313 10.3	· · 57.8	334 53.5	· · 56.3	280 56.3	· · 15.7
	04	86 32.0	264 40.6	51.6	328 11.5	57.6	349 55.9	56.3	295 58.5	15.6
	05	101 34.4	279 40.2	50.4	343 12.7	57.5	4 58.3	56.3	311 00.8	15.6
	06	116 36.9	294 39.8	N 0 49.2	358 13.9	N21 57.3	20 00.8	N22 56.3	326 03.0	N13 15.5
	07	131 39.4	309 39.4	48.0	13 15.1	57.1	35 03.2	56.3	341 05.3	15.4
	08	146 41.8	324 39.0	46.8	28 16.3	57.0	50 05.6	56.3	356 07.5	15.3
T	09	161 44.3	339 38.6	· · 45.6	43 17.5	· · 56.8	65 08.0	· · 56.3	11 09.8	· · 15.3
U	10	176 46.7	354 38.3	44.3	58 18.8	56.7	80 10.4	56.3	26 12.0	15.2
E	11	191 49.2	9 37.9	43.1	73 20.0	56.5	95 12.8	56.3	41 14.3	15.1
S	12	206 51.7	24 37.5	N 0 41.9	88 21.2	N21 56.4	110 15.2	N22 56.3	56 16.5	N13 15.1
D	13	221 54.1	39 37.1	40.7	103 22.4	56.2	125 17.6	56.3	71 18.8	15.0
A	14	236 56.6	54 36.7	39.5	118 23.6	56.0	140 20.0	56.3	86 21.0	14.9
Y	15	251 59.1	69 36.3	· · 38.3	133 24.8	· · 55.9	155 22.4	· · 56.3	101 23.3	· · 14.9
	16	267 01.5	84 35.9	37.1	148 26.0	55.7	170 24.9	56.3	116 25.5	14.8
	17	282 04.0	99 35.6	35.9	163 27.2	55.6	185 27.3	56.3	131 27.8	14.7
	18	297 06.5	114 35.2	N 0 34.7	178 28.5	N21 55.4	200 29.7	N22 56.3	146 30.0	N13 14.6
	19	312 08.9	129 34.8	33.5	193 29.7	55.3	215 32.1	56.3	161 32.3	14.6
	20	327 11.4	144 34.4	32.3	208 30.9	55.1	230 34.5	56.3	176 34.5	14.5
	21	342 13.9	159 34.0	· · 31.0	223 32.1	· · 54.9	245 36.9	· · 56.3	191 36.8	· · 14.4
	22	357 16.3	174 33.6	29.8	238 33.3	54.8	260 39.3	56.3	206 39.0	14.4
	23	12 18.8	189 33.2	28.6	253 34.5	54.6	275 41.8	56.3	221 41.3	14.3
	Mer. Pass.	h m 22 14.8	v −0.4	d 1.2	v 1.2	d 0.2	v 2.4	d 0.0	v 2.2	d 0.1

STARS

Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 38.4	S40 23.5
Achernar	335 46.2	S57 20.9
Acrux	173 40.0	S62 58.4
Adhara	255 33.6	S28 56.4
Aldebaran	291 20.0	N16 27.9
Alioth	166 44.9	N56 04.8
Alkaid	153 20.6	N49 25.6
Al Na'ir	28 17.2	S47 04.2
Alnilam	276 13.5	S 1 12.9
Alphard	218 22.6	S 8 33.6
Alphecca	126 34.1	N26 47.6
Alpheratz	358 11.0	N28 58.3
Altair	62 34.5	N 8 48.8
Ankaa	353 41.8	S42 25.6
Antares	112 59.5	S26 22.9
Arcturus	146 20.6	N19 18.0
Atria	108 25.9	S68 59.4
Avior	234 29.0	S59 26.1
Bellatrix	279 00.7	N 6 19.8
Betelgeuse	271 30.3	N 7 24.2
Canopus	264 07.9	S52 40.8
Capella	281 13.9	N45 58.4
Deneb	49 49.7	N45 12.5
Denebola	183 01.4	N14 41.8
Diphda	349 22.6	S18 06.4
Dubhe	194 25.2	N61 52.1
Elnath	278 46.4	N28 35.2
Eltanin	90 58.9	N51 29.9
Enif	34 13.4	N 9 46.6
Fomalhaut	15 53.4	S29 44.4
Gacrux	172 31.4	S56 59.2
Gienah	176 20.3	S17 25.0
Hadar	149 26.7	S60 15.9
Hamal	328 30.8	N23 21.5
Kaus Aust.	84 19.6	S34 23.7
Kochab	137 20.2	N74 15.0
Markab	14 04.9	N15 05.4
Menkar	314 42.9	N 4 00.2
Menkent	148 39.7	S36 15.5
Miaplacidus	221 45.6	S69 37.3
Mirfak	309 18.4	N49 46.9
Nunki	76 31.7	S26 19.4
Peacock	54 01.5	S56 48.5
Pollux	244 00.6	N28 04.7
Procyon	245 27.9	N 5 16.9
Rasalhague	96 31.6	N12 34.8
Regulus	208 12.3	N12 04.6
Rigel	281 37.7	S 8 13.6
Rigil Kent.	140 29.1	S60 44.5
Sabik	102 43.6	S15 41.7
Schedar	350 10.6	N56 25.1
Shaula	96 58.7	S37 05.3
Sirius	258 57.4	S16 41.1
Spica	158 59.9	S11 02.6
Suhail	223 12.3	S43 20.4
Vega	80 57.3	N38 46.2
Zuben'ubi	137 35.5	S15 56.8

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	179 28.5	10 21
Mars	242 15.0	6 09
Jupiter	263 25.7	4 44
Saturn	209 32.7	8 19

G.M.T.	SUN G.H.A.	SUN Dec.	MOON G.H.A.	MOON *v*	MOON Dec.	MOON *d*	MOON H.P.
d h	° ′	° ′	° ′	′	° ′	′	′
16 00	183 34.4	S 8 45.8	140 20.9	5.4	S17 11.2	4.1	60.2
01	198 34.5	46.7	154 45.3	5.4	17 15.3	4.1	60.2
02	213 34.7	47.6	169 09.7	5.3	17 19.4	3.9	60.2
03	228 34.8	·· 48.5	183 34.0	5.4	17 23.3	3.9	60.1
04	243 34.9	49.4	197 58.4	5.3	17 27.2	3.7	60.1
05	258 35.1	50.4	212 22.7	5.3	17 30.9	3.5	60.1
06	273 35.2	S 8 51.3	226 47.0	5.3	S17 34.4	3.5	60.1
07	288 35.3	52.2	241 11.3	5.3	17 37.9	3.3	60.1
08	303 35.5	53.1	255 35.6	5.3	17 41.2	3.2	60.1
S 09	318 35.6	·· 54.0	269 59.9	5.3	17 44.4	3.1	60.1
U 10	333 35.7	55.0	284 24.2	5.2	17 47.5	2.9	60.1
N 11	348 35.9	55.9	298 48.4	5.3	17 50.4	2.9	60.1
D 12	3 36.0	S 8 56.8	313 12.7	5.2	S17 53.3	2.7	60.1
A 13	18 36.1	57.7	327 36.9	5.3	17 56.0	2.6	60.1
Y 14	33 36.2	58.6	342 01.2	5.2	17 58.6	2.4	60.1
15	48 36.4	8 59.6	356 25.4	5.3	18 01.0	2.4	60.0
16	63 36.5	9 00.5	10 49.7	5.2	18 03.4	2.2	60.0
17	78 36.6	01.4	25 13.9	5.3	18 05.6	2.0	60.0
18	93 36.8	S 9 02.3	39 38.2	5.2	S18 07.6	2.0	60.0
19	108 36.9	03.2	54 02.4	5.3	18 09.6	1.8	60.0
20	123 37.0	04.1	68 26.7	5.2	18 11.4	1.7	60.0
21	138 37.2	·· 05.1	82 50.9	5.3	18 13.1	1.6	60.0
22	153 37.3	06.0	97 15.2	5.3	18 14.7	1.4	60.0
23	168 37.4	06.9	111 39.5	5.2	18 16.1	1.3	60.0
17 00	183 37.5	S 9 07.8	126 03.7	5.3	S18 17.4	1.2	59.9
01	198 37.7	08.7	140 28.0	5.3	18 18.6	1.1	59.9
02	213 37.8	09.6	154 52.3	5.3	18 19.7	0.9	59.9
03	228 37.9	·· 10.6	169 16.6	5.4	18 20.6	0.8	59.9
04	243 38.1	11.5	183 41.0	5.3	18 21.4	0.7	59.9
05	258 38.2	12.4	198 05.3	5.4	18 22.1	0.6	59.9
06	273 38.3	S 9 13.3	212 29.7	5.3	S18 22.7	0.4	59.9
07	288 38.4	14.2	226 54.0	5.4	18 23.1	0.3	59.8
08	303 38.6	15.1	241 18.4	5.4	18 23.4	0.2	59.8
M 09	318 38.7	·· 16.1	255 42.8	5.5	18 23.6	0.0	59.8
O 10	333 38.8	17.0	270 07.3	5.4	18 23.6	0.1	59.8
N 11	348 38.9	17.9	284 31.7	5.5	18 23.5	0.2	59.8
D 12	3 39.1	S 9 18.8	298 56.2	5.5	S18 23.3	0.3	59.8
A 13	18 39.2	19.7	313 20.7	5.5	18 23.0	0.4	59.8
Y 14	33 39.3	20.6	327 45.2	5.5	18 22.6	0.6	59.7
15	48 39.4	·· 21.5	342 09.7	5.6	18 22.0	0.7	59.7
16	63 39.6	22.4	356 34.3	5.6	18 21.3	0.8	59.7
17	78 39.7	23.4	10 58.9	5.7	18 20.5	1.0	59.7
18	93 39.8	S 9 24.3	25 23.6	5.6	S18 19.5	1.1	59.7
19	108 39.9	25.2	39 48.2	5.7	18 18.4	1.2	59.7
20	123 40.1	26.1	54 12.9	5.7	18 17.2	1.3	59.6
21	138 40.2	·· 27.0	68 37.6	5.8	18 15.9	1.4	59.6
22	153 40.3	27.9	83 02.4	5.8	18 14.5	1.6	59.6
23	168 40.4	28.8	97 27.2	5.8	18 12.9	1.7	59.6
18 00	183 40.6	S 9 29.7	111 52.0	5.9	S18 11.2	1.8	59.6
01	198 40.7	30.7	126 16.9	5.9	18 09.4	1.9	59.6
02	213 40.8	31.6	140 41.8	6.0	18 07.5	2.0	59.5
03	228 40.9	·· 32.5	155 06.8	6.0	18 05.5	2.2	59.5
04	243 41.0	33.4	169 31.8	6.0	18 03.3	2.3	59.5
05	258 41.2	34.3	183 56.8	6.1	18 01.0	2.4	59.5
06	273 41.3	S 9 35.2	198 21.9	6.1	S17 58.6	2.5	59.5
07	288 41.4	36.1	212 47.0	6.1	17 56.1	2.7	59.4
08	303 41.5	37.0	227 12.1	6.2	17 53.4	2.7	59.4
T 09	318 41.7	·· 37.9	241 37.3	6.3	17 50.7	2.9	59.4
U 10	333 41.8	38.8	256 02.6	6.3	17 47.8	3.0	59.4
E 11	348 41.9	39.7	270 27.9	6.3	17 44.8	3.1	59.4
S 12	3 42.0	S 9 40.7	284 53.2	6.4	S17 41.7	3.2	59.3
D 13	18 42.1	41.6	299 18.6	6.4	17 38.5	3.3	59.3
A 14	33 42.2	42.5	313 44.0	6.5	17 35.2	3.4	59.3
Y 15	48 42.4	·· 43.4	328 09.5	6.5	17 31.8	3.6	59.3
16	63 42.5	44.3	342 35.0	6.6	17 28.2	3.6	59.3
17	78 42.6	45.2	357 00.6	6.7	17 24.6	3.8	59.2
18	93 42.7	S 9 46.1	11 26.3	6.7	S17 20.8	3.9	59.2
19	108 42.8	47.0	25 52.0	6.7	17 16.9	4.0	59.2
20	123 43.0	47.9	40 17.7	6.8	17 12.9	4.1	59.2
21	138 43.1	·· 48.8	54 43.5	6.8	17 08.8	4.2	59.2
22	153 43.2	49.7	69 09.3	6.9	17 04.6	4.3	59.1
23	168 43.3	50.6	83 35.2	7.0	17 00.3	4.4	59.1
	S.D. 16.1	*d* 0.9	S.D.	16.4		16.3	16.2

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 16	Moonrise 17	Moonrise 18	Moonrise 19
°	h m	h m	h m	h m	h m	h m	h m
N 72	05 03	06 22	07 33	■	■	16 21	16 03
N 70	05 06	06 17	07 21	13 27	14 39	15 12	15 25
68	05 08	06 13	07 11	12 45	13 53	14 35	14 59
66	05 10	06 09	07 02	12 16	13 23	14 09	14 39
64	05 11	06 06	06 55	11 55	13 01	13 49	14 22
62	05 12	06 04	06 49	11 37	12 43	13 32	14 09
60	05 13	06 01	06 44	11 23	12 28	13 19	13 57
N 58	05 14	05 59	06 39	11 11	12 15	13 07	13 47
56	05 14	05 57	06 35	11 00	12 04	12 56	13 39
54	05 14	05 55	06 31	10 51	11 54	12 47	13 31
52	05 15	05 54	06 28	10 43	11 46	12 39	13 24
50	05 15	05 52	06 25	10 35	11 38	12 32	13 18
45	05 14	05 48	06 18	10 19	11 21	12 16	13 04
N 40	05 14	05 45	06 12	10 06	11 08	12 04	12 53
35	05 12	05 42	06 07	09 55	10 56	11 53	12 43
30	05 11	05 39	06 03	09 45	10 46	11 43	12 35
20	05 07	05 33	05 55	09 29	10 29	11 27	12 20
N 10	05 03	05 27	05 49	09 14	10 14	11 12	12 07
0	04 57	05 21	05 42	09 01	10 00	10 59	11 55
S 10	04 49	05 14	05 35	08 47	09 46	10 45	11 43
20	04 40	05 06	05 28	08 33	09 31	10 31	11 31
30	04 27	04 56	05 20	08 17	09 14	10 14	11 16
35	04 18	04 49	05 15	08 07	09 04	10 05	11 07
40	04 08	04 42	05 10	07 56	08 53	09 54	10 58
45	03 56	04 33	05 03	07 44	08 40	09 41	10 46
S 50	03 40	04 22	04 56	07 28	08 23	09 25	10 32
52	03 32	04 16	04 52	07 21	08 16	09 18	10 26
54	03 23	04 10	04 48	07 13	08 07	09 10	10 19
56	03 13	04 04	04 44	07 04	07 58	09 01	10 11
58	03 02	03 56	04 39	06 54	07 47	08 50	10 02
S 60	02 47	03 48	04 33	06 43	07 35	08 39	09 51

Lat.	Sunset	Twilight Civil	Twilight Naut.	Moonset 16	Moonset 17	Moonset 18	Moonset 19
°	h m	h m	h m	h m	h m	h m	h m
N 72	15 56	17 07	18 25	■	■	18 11	20 26
N 70	16 08	17 12	18 22	16 59	17 51	19 19	21 03
68	16 19	17 16	18 20	17 41	18 37	19 56	21 28
66	16 27	17 20	18 19	18 10	19 07	20 21	21 48
64	16 34	17 23	18 18	18 32	19 29	20 41	22 03
62	16 40	17 26	18 17	18 49	19 47	20 57	22 16
60	16 46	17 28	18 16	19 04	20 02	21 11	22 27
N 58	16 51	17 30	18 16	19 16	20 15	21 22	22 37
56	16 55	17 33	18 16	19 27	20 26	21 32	22 45
54	16 59	17 34	18 15	19 37	20 35	21 41	22 52
52	17 02	17 36	18 15	19 45	20 44	21 49	22 59
50	17 05	17 38	18 15	19 53	20 51	21 56	23 05
45	17 12	17 42	18 16	20 09	21 08	22 11	23 18
N 40	17 18	17 45	18 17	20 22	21 21	22 24	23 28
35	17 23	17 48	18 18	20 33	21 33	22 34	23 37
30	17 27	17 51	18 19	20 43	21 42	22 44	23 45
20	17 35	17 57	18 23	21 00	22 00	22 59	23 59
N 10	17 42	18 03	18 28	21 15	22 14	23 13	24 10
0	17 49	18 10	18 34	21 29	22 28	23 26	24 21
S 10	17 55	18 17	18 42	21 43	22 42	23 39	24 32
20	18 03	18 25	18 51	21 58	22 57	23 52	24 44
30	18 11	18 36	19 05	22 15	23 14	24 08	00 08
35	18 16	18 42	19 13	22 25	23 24	24 17	00 17
40	18 22	18 50	19 23	22 36	23 35	24 27	00 27
45	18 28	18 59	19 36	22 49	23 48	24 39	00 39
S 50	18 36	19 10	19 52	23 05	24 04	00 04	00 54
52	18 40	19 16	20 00	23 13	24 11	00 11	01 00
54	18 44	19 22	20 09	23 21	24 20	00 20	01 08
56	18 49	19 29	20 20	23 30	24 29	00 29	01 16
58	18 54	19 36	20 32	23 41	24 39	00 39	01 26
S 60	18 59	19 45	20 46	23 54	24 51	00 51	01 36

Day	SUN Eqn. of Time 00ʰ	SUN Eqn. of Time 12ʰ	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
	m s	m s	h m	h m	h m	d	
16	14 17	14 24	11 46	15 15	02 45	04	🌒
17	14 30	14 36	11 45	16 14	03 45	05	
18	14 42	14 48	11 45	17 12	04 44	06	

G.M.T.		ARIES	VENUS −3.4		MARS +0.6		JUPITER −2.0		SATURN +0.8	
		G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
d	h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
19	00	27 21.2	204 32.8	N 0 27.4	268 35.7	N21 54.5	290 44.2	N22 56.3	236 43.5	N13 14.2
	01	42 23.7	219 32.5	26.2	283 37.0	54.3	305 46.6	56.3	251 45.8	14.2
	02	57 26.2	234 32.1	25.0	298 38.2	54.2	320 49.0	56.3	266 48.0	14.1
	03	72 28.6	249 31.7	·· 23.8	313 39.4	·· 54.0	335 51.4	·· 56.3	281 50.3	·· 14.0
	04	87 31.1	264 31.3	22.6	328 40.6	53.8	350 53.8	56.3	296 52.5	14.0
	05	102 33.6	279 30.9	21.4	343 41.8	53.7	5 56.2	56.3	311 54.8	13.9
	06	117 36.0	294 30.5	N 0 20.2	358 43.1	N21 53.5	20 58.7	N22 56.3	326 57.0	N13 13.8
WEDNESDAY	07	132 38.5	309 30.1	19.0	13 44.3	53.4	36 01.1	56.3	341 59.3	13.8
	08	147 41.0	324 29.7	17.7	28 45.5	53.2	51 03.5	56.3	357 01.5	13.7
	09	162 43.4	339 29.4	·· 16.5	43 46.7	·· 53.1	66 05.9	·· 56.3	12 03.8	·· 13.6
	10	177 45.9	354 29.0	15.3	58 47.9	52.9	81 08.3	56.3	27 06.0	13.5
	11	192 48.3	9 28.6	14.1	73 49.2	52.7	96 10.8	56.3	42 08.3	13.5
	12	207 50.8	24 28.2	N 0 12.9	88 50.4	N21 52.6	111 13.2	N22 56.3	57 10.5	N13 13.4
	13	222 53.3	39 27.8	11.7	103 51.6	52.4	126 15.6	56.3	72 12.8	13.3
	14	237 55.7	54 27.4	10.5	118 52.8	52.3	141 18.0	56.3	87 15.0	13.3
	15	252 58.2	69 27.0	·· 09.3	133 54.1	·· 52.1	156 20.4	·· 56.3	102 17.3	·· 13.2
	16	268 00.7	84 26.6	08.1	148 55.3	51.9	171 22.9	56.3	117 19.5	13.1
	17	283 03.1	99 26.3	06.8	163 56.5	51.8	186 25.3	56.3	132 21.8	13.1
	18	298 05.6	114 25.9	N 0 05.6	178 57.7	N21 51.6	201 27.7	N22 56.3	147 24.1	N13 13.0
	19	313 08.1	129 25.5	04.4	193 59.0	51.5	216 30.1	56.3	162 26.3	12.9
	20	328 10.5	144 25.1	03.2	209 00.2	51.3	231 32.5	56.3	177 28.6	12.9
	21	343 13.0	159 24.7	·· 02.0	224 01.4	·· 51.2	246 35.0	·· 56.3	192 30.8	·· 12.8
	22	358 15.5	174 24.3	N 0 00.8	239 02.7	51.0	261 37.4	56.3	207 33.1	12.7
	23	13 17.9	189 23.9	S 0 00.4	254 03.9	50.8	276 39.8	56.3	222 35.3	12.7
20	00	28 20.4	204 23.5	S 0 01.6	269 05.1	N21 50.7	291 42.2	N22 56.3	237 37.6	N13 12.6
	01	43 22.8	219 23.2	02.8	284 06.4	50.5	306 44.7	56.3	252 39.8	12.5
	02	58 25.3	234 22.8	04.1	299 07.6	50.4	321 47.1	56.3	267 42.1	12.5
	03	73 27.8	249 22.4	·· 05.3	314 08.8	·· 50.2	336 49.5	·· 56.3	282 44.3	·· 12.4
	04	88 30.2	264 22.0	06.5	329 10.1	50.0	351 51.9	56.3	297 46.6	12.3
	05	103 32.7	279 21.6	07.7	344 11.3	49.9	6 54.4	56.3	312 48.8	12.3
	06	118 35.2	294 21.2	S 0 08.9	359 12.5	N21 49.7	21 56.8	N22 56.3	327 51.1	N13 12.2
	07	133 37.6	309 20.8	10.1	14 13.8	49.6	36 59.2	56.3	342 53.4	12.1
THURSDAY	08	148 40.1	324 20.4	11.3	29 15.0	49.4	52 01.6	56.3	357 55.6	12.1
	09	163 42.6	339 20.1	·· 12.5	44 16.2	·· 49.3	67 04.1	·· 56.3	12 57.9	·· 12.0
	10	178 45.0	354 19.7	13.8	59 17.5	49.1	82 06.5	56.3	28 00.1	11.9
	11	193 47.5	9 19.3	15.0	74 18.7	48.9	97 08.9	56.3	43 02.4	11.9
	12	208 50.0	24 18.9	S 0 16.2	89 19.9	N21 48.8	112 11.4	N22 56.4	58 04.6	N13 11.8
	13	223 52.4	39 18.5	17.4	104 21.2	48.6	127 13.8	56.4	73 06.9	11.7
	14	238 54.9	54 18.1	18.6	119 22.4	48.5	142 16.2	56.4	88 09.1	11.7
	15	253 57.3	69 17.7	·· 19.8	134 23.6	·· 48.3	157 18.6	·· 56.4	103 11.4	·· 11.6
	16	268 59.8	84 17.3	21.0	149 24.9	48.1	172 21.1	56.4	118 13.6	11.5
	17	284 02.3	99 16.9	22.2	164 26.1	48.0	187 23.5	56.4	133 15.9	11.4
	18	299 04.7	114 16.6	S 0 23.5	179 27.4	N21 47.8	202 25.9	N22 56.4	148 18.2	N13 11.4
	19	314 07.2	129 16.2	24.7	194 28.6	47.7	217 28.4	56.4	163 20.4	11.3
	20	329 09.7	144 15.8	25.9	209 29.9	47.5	232 30.8	56.4	178 22.7	11.2
	21	344 12.1	159 15.4	·· 27.1	224 31.1	·· 47.4	247 33.2	·· 56.4	193 24.9	·· 11.2
	22	359 14.6	174 15.0	28.3	239 32.3	47.2	262 35.7	56.4	208 27.2	11.1
	23	14 17.1	189 14.6	29.5	254 33.6	47.0	277 38.1	56.4	223 29.4	11.0
21	00	29 19.5	204 14.2	S 0 30.7	269 34.8	N21 46.9	292 40.5	N22 56.4	238 31.7	N13 11.0
	01	44 22.0	219 13.8	31.9	284 36.1	46.7	307 43.0	56.4	253 34.0	10.9
	02	59 24.4	234 13.4	33.2	299 37.3	46.6	322 45.4	56.4	268 36.2	10.8
	03	74 26.9	249 13.1	·· 34.4	314 38.6	·· 46.4	337 47.8	·· 56.4	283 38.5	·· 10.8
	04	89 29.4	264 12.7	35.6	329 39.8	46.2	352 50.3	56.4	298 40.7	10.7
	05	104 31.8	279 12.3	36.8	344 41.1	46.1	7 52.7	56.4	313 43.0	10.6
	06	119 34.3	294 11.9	S 0 38.0	359 42.3	N21 45.9	22 55.1	N22 56.4	328 45.2	N13 10.6
	07	134 36.8	309 11.5	39.2	14 43.5	45.8	37 57.6	56.4	343 47.5	10.5
	08	149 39.2	324 11.1	40.4	29 44.8	45.6	53 00.0	56.4	358 49.8	10.4
FRIDAY	09	164 41.7	339 10.7	·· 41.6	44 46.0	·· 45.4	68 02.4	·· 56.4	13 52.0	·· 10.4
	10	179 44.2	354 10.3	42.9	59 47.3	45.3	83 04.9	56.4	28 54.3	10.3
	11	194 46.6	9 09.9	44.1	74 48.5	45.1	98 07.3	56.4	43 56.5	10.2
	12	209 49.1	24 09.6	S 0 45.3	89 49.8	N21 45.0	113 09.7	N22 56.4	58 58.8	N13 10.2
	13	224 51.6	39 09.2	46.5	104 51.0	44.8	128 12.2	56.4	74 01.0	10.1
	14	239 54.0	54 08.8	47.7	119 52.3	44.7	143 14.6	56.4	89 03.3	10.1
	15	254 56.5	69 08.4	·· 48.9	134 53.6	·· 44.5	158 17.1	·· 56.4	104 05.6	·· 10.0
	16	269 58.9	84 08.0	50.1	149 54.8	44.3	173 19.5	56.4	119 07.8	09.9
	17	285 01.4	99 07.6	51.4	164 56.1	44.2	188 21.9	56.4	134 10.1	09.9
	18	300 03.9	114 07.2	S 0 52.6	179 57.3	N21 44.0	203 24.4	N22 56.4	149 12.3	N13 09.8
	19	315 06.3	129 06.8	53.8	194 58.6	43.9	218 26.8	56.4	164 14.6	09.7
	20	330 08.8	144 06.4	55.0	209 59.8	43.7	233 29.3	56.4	179 16.9	09.7
	21	345 11.3	159 06.0	·· 56.2	225 01.1	·· 43.5	248 31.7	·· 56.4	194 19.1	·· 09.6
	22	0 13.7	174 05.7	57.4	240 02.3	43.4	263 34.1	56.4	209 21.4	09.5
	23	15 16.2	189 05.3	58.6	255 03.6	43.2	278 36.6	56.4	224 23.6	09.5
Mer. Pass.		h m 22 03.0	*v* −0.4	*d* 1.2	*v* 1.2	*d* 0.2	*v* 2.4	*d* 0.0	*v* 2.3	*d* 0.1

STARS

Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 38.4	S40 23.5
Achernar	335 46.2	S57 20.9
Acrux	173 40.0	S62 58.4
Adhara	255 33.6	S28 56.4
Aldebaran	291 20.0	N16 27.9
Alioth	166 44.9	N56 04.8
Alkaid	153 20.6	N49 25.5
Al Na'ir	28 17.2	S47 04.2
Alnilam	276 13.5	S 1 12.9
Alphard	218 22.6	S 8 33.7
Alphecca	126 34.1	N26 47.6
Alpheratz	358 11.0	N28 58.3
Altair	62 34.5	N 8 48.8
Ankaa	353 41.8	S42 25.6
Antares	112 59.6	S26 22.9
Arcturus	146 20.6	N19 18.0
Atria	108 25.9	S68 59.4
Avior	234 29.0	S59 26.1
Bellatrix	279 00.7	N 6 19.8
Betelgeuse	271 30.2	N 7 24.2
Canopus	264 07.9	S52 40.8
Capella	281 13.9	N45 58.4
Deneb	49 49.7	N45 12.5
Denebola	183 01.4	N14 41.8
Diphda	349 22.6	S18 06.4
Dubhe	194 25.2	N61 52.1
Elnath	278 46.4	N28 35.2
Eltanin	90 58.9	N51 29.9
Enif	34 13.4	N 9 46.6
Fomalhaut	15 53.4	S29 44.4
Gacrux	172 31.4	S56 59.2
Gienah	176 20.3	S17 25.0
Hadar	149 26.7	S60 15.9
Hamal	328 30.8	N23 21.5
Kaus Aust.	84 19.6	S34 23.7
Kochab	137 20.2	N74 15.0
Markab	14 04.9	N15 05.4
Menkar	314 42.9	N 4 00.2
Menkent	148 39.7	S36 15.5
Miaplacidus	221 45.5	S69 37.3
Mirfak	309 18.4	N49 46.9
Nunki	76 31.7	S26 19.4
Peacock	54 01.5	S56 48.5
Pollux	244 00.6	N28 04.7
Procyon	245 27.8	N 5 16.9
Rasalhague	96 31.6	N12 34.8
Regulus	208 12.3	N12 04.5
Rigel	281 37.7	S 8 13.6
Rigil Kent.	140 29.1	S60 44.5
Sabik	102 43.6	S15 41.7
Schedar	350 10.6	N56 25.1
Shaula	96 58.7	S37 05.3
Sirius	258 57.3	S16 41.1
Spica	158 59.9	S11 02.6
Suhail	223 12.3	S43 20.4
Vega	80 57.3	N38 46.2
Zuben'ubi	137 35.5	S15 56.8

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	176 03.2	10 23
Mars	240 44.7	6 03
Jupiter	263 21.9	4 32
Saturn	209 17.2	8 08

G.M.T.		SUN G.H.A.	SUN Dec.	MOON G.H.A.	MOON v	MOON Dec.	MOON d	MOON H.P.
d	h	° ′	° ′	° ′	′	° ′	′	′
19	00	183 43.4	S 9 51.5	98 01.2	7.0	S16 55.9	4.5	59.1
	01	198 43.5	52.4	112 27.2	7.1	16 51.4	4.6	59.1
	02	213 43.7	53.3	126 53.3	7.1	16 46.8	4.8	59.1
	03	228 43.8	·· 54.2	141 19.4	7.2	16 42.0	4.8	59.0
	04	243 43.9	55.2	155 45.6	7.2	16 37.2	4.9	59.0
	05	258 44.0	56.1	170 11.8	7.3	16 32.3	5.0	59.0
	06	273 44.1	S 9 57.0	184 38.1	7.4	S16 27.3	5.2	59.0
	07	288 44.2	57.9	199 04.5	7.4	16 22.1	5.2	58.9
W	08	303 44.3	58.8	213 30.9	7.5	16 16.9	5.3	58.9
E	09	318 44.5	9 59.7	227 57.4	7.5	16 11.6	5.4	58.9
D	10	333 44.6	10 00.6	242 23.9	7.6	16 06.2	5.6	58.9
N	11	348 44.7	01.5	256 50.5	7.7	16 00.6	5.6	58.9
E	12	3 44.8	S10 02.4	271 17.2	7.7	S15 55.0	5.7	58.8
S	13	18 44.9	03.3	285 43.9	7.8	15 49.3	5.8	58.8
D	14	33 45.0	04.2	300 10.7	7.8	15 43.5	5.9	58.8
A	15	48 45.1	·· 05.1	314 37.5	7.9	15 37.6	5.9	58.8
Y	16	63 45.2	06.0	329 04.4	8.0	15 31.7	6.1	58.8
	17	78 45.4	06.9	343 31.4	8.0	15 25.6	6.2	58.7
	18	93 45.5	S10 07.8	357 58.4	8.1	S15 19.4	6.2	58.7
	19	108 45.6	08.7	12 25.5	8.1	15 13.2	6.4	58.7
	20	123 45.7	09.6	26 52.6	8.2	15 06.8	6.4	58.7
	21	138 45.8	·· 10.5	41 19.8	8.3	15 00.4	6.5	58.6
	22	153 45.9	11.4	55 47.1	8.3	14 53.9	6.6	58.6
	23	168 46.0	12.3	70 14.4	8.4	14 47.3	6.7	58.6
20	00	183 46.1	S10 13.2	84 41.8	8.5	S14 40.6	6.7	58.6
	01	198 46.2	14.1	99 09.3	8.5	14 33.9	6.9	58.5
	02	213 46.4	15.0	113 36.8	8.6	14 27.0	6.9	58.5
	03	228 46.5	·· 15.9	128 04.4	8.6	14 20.1	7.0	58.5
	04	243 46.6	16.8	142 32.0	8.7	14 13.1	7.1	58.5
	05	258 46.7	17.7	156 59.7	8.8	14 06.0	7.1	58.5
	06	273 46.8	S10 18.6	171 27.5	8.8	S13 58.9	7.3	58.4
	07	288 46.9	19.5	185 55.3	8.9	13 51.6	7.3	58.4
T	08	303 47.0	20.4	200 23.2	9.0	13 44.3	7.3	58.4
H	09	318 47.1	·· 21.3	214 51.2	9.0	13 37.0	7.5	58.4
U	10	333 47.2	22.2	229 19.2	9.1	13 29.5	7.5	58.3
R	11	348 47.3	23.1	243 47.3	9.1	13 22.0	7.6	58.3
S	12	3 47.4	S10 23.9	258 15.4	9.2	S13 14.4	7.7	58.3
D	13	18 47.5	24.8	272 43.6	9.3	13 06.7	7.7	58.3
A	14	33 47.6	25.7	287 11.9	9.3	12 59.0	7.8	58.3
Y	15	48 47.8	·· 26.6	301 40.2	9.4	12 51.2	7.9	58.2
	16	63 47.9	27.5	316 08.6	9.4	12 43.3	8.0	58.2
	17	78 48.0	28.4	330 37.0	9.5	12 35.3	8.0	58.2
	18	93 48.1	S10 29.3	345 05.5	9.6	S12 27.3	8.1	58.2
	19	108 48.2	30.2	359 34.1	9.6	12 19.2	8.1	58.1
	20	123 48.3	31.1	14 02.7	9.7	12 11.1	8.2	58.1
	21	138 48.4	·· 32.0	28 31.4	9.8	12 02.9	8.2	58.1
	22	153 48.5	32.9	43 00.2	9.8	11 54.7	8.4	58.1
	23	168 48.6	33.8	57 29.0	9.8	11 46.3	8.4	58.0
21	00	183 48.7	S10 34.7	71 57.8	9.9	S11 37.9	8.4	58.0
	01	198 48.8	35.6	86 26.7	10.0	11 29.5	8.5	58.0
	02	213 48.9	36.5	100 55.7	10.1	11 21.0	8.5	58.0
	03	228 49.0	·· 37.4	115 24.8	10.1	11 12.5	8.7	58.0
	04	243 49.1	38.2	129 53.9	10.1	11 03.8	8.6	57.9
	05	258 49.2	39.1	144 23.0	10.2	10 55.2	8.7	57.9
	06	273 49.3	S10 40.0	158 52.2	10.3	S10 46.5	8.8	57.9
	07	288 49.4	40.9	173 21.5	10.3	10 37.7	8.8	57.9
	08	303 49.5	41.8	187 50.8	10.4	10 28.9	8.9	57.8
F	09	318 49.6	·· 42.7	202 20.2	10.5	10 20.0	8.9	57.8
R	10	333 49.7	43.6	216 49.7	10.4	10 11.1	9.0	57.8
I	11	348 49.8	44.5	231 19.1	10.6	10 02.1	9.0	57.8
D	12	3 49.9	S10 45.4	245 48.7	10.6	S 9 53.1	9.1	57.7
A	13	18 50.0	46.3	260 18.3	10.6	9 44.0	9.1	57.7
Y	14	33 50.1	47.1	274 47.9	10.7	9 34.9	9.1	57.7
	15	48 50.2	·· 48.0	289 17.6	10.8	9 25.8	9.2	57.7
	16	63 50.3	48.9	303 47.4	10.8	9 16.6	9.3	57.7
	17	78 50.4	49.8	318 17.2	10.9	9 07.3	9.3	57.6
	18	93 50.5	S10 50.7	332 47.1	10.9	S 8 58.0	9.3	57.6
	19	108 50.6	51.6	347 17.0	11.0	8 48.7	9.4	57.6
	20	123 50.7	52.5	1 47.0	11.0	8 39.3	9.4	57.6
	21	138 50.8	·· 53.4	16 17.0	11.0	8 29.9	9.4	57.5
	22	153 50.9	54.2	30 47.0	11.2	8 20.5	9.5	57.5
	23	168 51.0	55.1	45 17.2	11.1	8 11.0	9.5	57.5
		S.D. 16.1	d 0.9	S.D. 16.0		15.9		15.7

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 19	Moonrise 20	Moonrise 21	Moonrise 22
°	h m	h m	h m	h m	h m	h m	h m
N 72	05 16	06 35	07 48	16 03	15 54	15 48	15 42
N 70	05 18	06 29	07 34	15 25	15 31	15 33	15 34
68	05 19	06 23	07 22	14 59	15 13	15 22	15 28
66	05 19	06 19	07 12	14 39	14 58	15 12	15 22
64	05 20	06 15	07 04	14 22	14 46	15 04	15 18
62	05 20	06 12	06 57	14 09	14 36	14 57	15 14
60	05 20	06 08	06 51	13 57	14 27	14 51	15 10
N 58	05 20	06 06	06 46	13 47	14 19	14 45	15 07
56	05 20	06 03	06 41	13 39	14 13	14 40	15 05
54	05 20	06 01	06 37	13 31	14 06	14 36	15 02
52	05 19	05 59	06 33	13 24	14 01	14 32	15 00
50	05 19	05 57	06 30	13 18	13 56	14 29	14 58
45	05 18	05 52	06 22	13 04	13 45	14 21	14 53
N 40	05 17	05 48	06 16	12 53	13 36	14 14	14 50
35	05 15	05 44	06 10	12 43	13 28	14 09	14 46
30	05 13	05 41	06 05	12 35	13 21	14 04	14 43
20	05 08	05 34	05 56	12 20	13 09	13 55	14 38
N 10	05 03	05 27	05 49	12 07	12 59	13 48	14 34
0	04 56	05 20	05 41	11 55	12 49	13 41	14 30
S 10	04 48	05 13	05 34	11 43	12 40	13 34	14 26
20	04 37	05 04	05 26	11 31	12 29	13 26	14 21
30	04 23	04 52	05 17	11 16	12 17	13 17	14 16
35	04 14	04 45	05 11	11 07	12 10	13 12	14 13
40	04 04	04 37	05 05	10 58	12 02	13 07	14 10
45	03 50	04 27	04 58	10 46	11 53	13 00	14 06
S 50	03 33	04 15	04 49	10 32	11 42	12 52	14 02
52	03 24	04 09	04 45	10 26	11 37	12 48	14 00
54	03 15	04 03	04 41	10 19	11 31	12 44	13 57
56	03 04	03 56	04 36	10 11	11 25	12 40	13 55
58	02 51	03 47	04 31	10 02	11 18	12 35	13 52
S 60	02 35	03 38	04 24	09 51	11 09	12 29	13 49

Lat.	Sunset	Twilight Civil	Twilight Naut.	Moonset 19	Moonset 20	Moonset 21	Moonset 22
°	h m	h m	h m	h m	h m	h m	h m
N 72	15 39	16 53	18 11	20 26	22 26	24 17	00 17
N 70	15 54	16 59	18 10	21 03	22 47	24 30	00 30
68	16 06	17 05	18 09	21 28	23 04	24 40	00 40
66	16 16	17 09	18 09	21 48	23 18	24 48	00 48
64	16 24	17 13	18 08	22 03	23 29	24 56	00 56
62	16 31	17 17	18 08	22 16	23 39	25 02	01 02
60	16 37	17 20	18 08	22 27	23 47	25 07	01 07
N 58	16 43	17 23	18 08	22 37	23 54	25 11	01 11
56	16 47	17 25	18 09	22 45	24 00	00 00	01 15
54	16 52	17 28	18 09	22 52	24 06	00 06	01 19
52	16 56	17 30	18 09	22 59	24 11	00 11	01 22
50	16 59	17 32	18 10	23 05	24 15	00 15	01 25
45	17 07	17 37	18 11	23 18	24 25	00 25	01 32
N 40	17 14	17 41	18 13	23 28	24 33	00 33	01 37
35	17 19	17 45	18 14	23 37	24 40	00 40	01 42
30	17 24	17 48	18 16	23 45	24 46	00 46	01 46
20	17 33	17 55	18 21	23 59	24 57	00 57	01 53
N 10	17 41	18 02	18 27	24 10	00 10	01 06	01 59
0	17 48	18 09	18 34	24 21	00 21	01 14	02 04
S 10	17 56	18 17	18 42	24 32	00 32	01 23	02 10
20	18 04	18 26	18 53	24 44	00 44	01 32	02 16
30	18 13	18 38	19 07	00 08	00 57	01 42	02 23
35	18 19	18 45	19 16	00 17	01 05	01 48	02 27
40	18 25	18 53	19 27	00 27	01 13	01 54	02 31
45	18 32	19 03	19 41	00 39	01 23	02 02	02 36
S 50	18 41	19 16	19 58	00 54	01 35	02 11	02 42
52	18 45	19 22	20 07	01 00	01 41	02 15	02 45
54	18 50	19 28	20 17	01 08	01 47	02 20	02 48
56	18 55	19 36	20 28	01 16	01 54	02 25	02 51
58	19 01	19 44	20 41	01 26	02 02	02 31	02 55
S 60	19 07	19 54	20 57	01 36	02 10	02 37	02 59

Day	SUN Eqn. of Time 00ʰ	SUN Eqn. of Time 12ʰ	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
	m s	m s	h m	h m	h m	d	
19	14 53	14 59	11 45	18 08	05 41	07	◐
20	15 04	15 10	11 45	19 02	06 35	08	
21	15 15	15 19	11 45	19 53	07 28	09	

1977 OCTOBER 22, 23, 24 (SAT., SUN., MON.)

G.M.T.	ARIES	VENUS −3.4		MARS +0.5		JUPITER −2.1		SATURN +0.8	
	G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
d h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
22 00	30 18.7	204 04.9	S 0 59.9	270 04.9	N21 43.1	293 39.0	N22 56.4	239 25.9	N13 09.4
01	45 21.1	219 04.5	1 01.1	285 06.1	42.9	308 41.5	56.4	254 28.2	09.3
02	60 23.6	234 04.1	02.3	300 07.4	42.7	323 43.9	56.4	269 30.4	09.3
03	75 26.1	249 03.7	·· 03.5	315 08.6	·· 42.6	338 46.4	·· 56.4	284 32.7	·· 09.2
04	90 28.5	264 03.3	04.7	330 09.9	42.4	353 48.8	56.4	299 34.9	09.1
05	105 31.0	279 02.9	05.9	345 11.2	42.3	8 51.2	56.4	314 37.2	09.1
06	120 33.4	294 02.5	S 1 07.1	0 12.4	N21 42.1	23 53.7	N22 56.4	329 39.5	N13 09.0
07	135 35.9	309 02.1	08.4	15 13.7	41.9	38 56.1	56.4	344 41.7	08.9
S 08	150 38.4	324 01.8	09.6	30 14.9	41.8	53 58.6	56.4	359 44.0	08.9
A 09	165 40.8	339 01.4	·· 10.8	45 16.2	·· 41.6	69 01.0	·· 56.4	14 46.2	·· 08.8
T 10	180 43.3	354 01.0	12.0	60 17.5	41.5	84 03.5	56.4	29 48.5	08.7
U 11	195 45.8	9 00.6	13.2	75 18.7	41.3	99 05.9	56.4	44 50.8	08.7
R 12	210 48.2	24 00.2	S 1 14.4	90 20.0	N21 41.2	114 08.4	N22 56.4	59 53.0	N13 08.6
D 13	225 50.7	38 59.8	15.6	105 21.3	41.0	129 10.8	56.4	74 55.3	08.5
A 14	240 53.2	53 59.4	16.9	120 22.5	40.8	144 13.2	56.4	89 57.5	08.5
Y 15	255 55.6	68 59.0	·· 18.1	135 23.8	·· 40.7	159 15.7	·· 56.4	104 59.8	·· 08.4
16	270 58.1	83 58.6	19.3	150 25.1	40.5	174 18.1	56.4	120 02.1	08.3
17	286 00.5	98 58.2	20.5	165 26.3	40.4	189 20.6	56.4	135 04.3	08.3
18	301 03.0	113 57.8	S 1 21.7	180 27.6	N21 40.2	204 23.0	N22 56.4	150 06.6	N13 08.2
19	316 05.5	128 57.4	22.9	195 28.9	40.0	219 25.5	56.4	165 08.9	08.2
20	331 07.9	143 57.1	24.1	210 30.1	39.9	234 27.9	56.4	180 11.1	08.1
21	346 10.4	158 56.7	·· 25.4	225 31.4	·· 39.7	249 30.4	·· 56.4	195 13.4	·· 08.0
22	1 12.9	173 56.3	26.6	240 32.7	39.6	264 32.8	56.4	210 15.6	08.0
23	16 15.3	188 55.9	27.8	255 33.9	39.4	279 35.3	56.4	225 17.9	07.9
23 00	31 17.8	203 55.5	S 1 29.0	270 35.2	N21 39.2	294 37.7	N22 56.4	240 20.2	N13 07.8
01	46 20.3	218 55.1	30.2	285 36.5	39.1	309 40.2	56.4	255 22.4	07.8
02	61 22.7	233 54.7	31.4	300 37.8	38.9	324 42.6	56.4	270 24.7	07.7
03	76 25.2	248 54.3	·· 32.6	315 39.0	·· 38.8	339 45.1	·· 56.4	285 27.0	·· 07.6
04	91 27.7	263 53.9	33.9	330 40.3	38.6	354 47.5	56.4	300 29.2	07.6
05	106 30.1	278 53.5	35.1	345 41.6	38.4	9 50.0	56.4	315 31.5	07.5
06	121 32.6	293 53.1	S 1 36.3	0 42.9	N21 38.3	24 52.5	N22 56.4	330 33.8	N13 07.4
07	136 35.0	308 52.7	37.5	15 44.1	38.1	39 54.9	56.4	345 36.0	07.4
08	151 37.5	323 52.3	38.7	30 45.4	38.0	54 57.4	56.4	0 38.3	07.3
S 09	166 40.0	338 52.0	·· 39.9	45 46.7	·· 37.8	69 59.8	·· 56.4	15 40.5	·· 07.3
U 10	181 42.4	353 51.6	41.1	60 48.0	37.7	85 02.3	56.4	30 42.8	07.2
N 11	196 44.9	8 51.2	42.4	75 49.2	37.5	100 04.7	56.5	45 45.1	07.1
D 12	211 47.4	23 50.8	S 1 43.6	90 50.5	N21 37.3	115 07.2	N22 56.5	60 47.3	N13 07.1
A 13	226 49.8	38 50.4	44.8	105 51.8	37.2	130 09.6	56.5	75 49.6	07.0
Y 14	241 52.3	53 50.0	46.0	120 53.1	37.0	145 12.1	56.5	90 51.9	06.9
15	256 54.8	68 49.6	·· 47.2	135 54.4	·· 36.9	160 14.5	·· 56.5	105 54.1	·· 06.9
16	271 57.2	83 49.2	48.4	150 55.6	36.7	175 17.0	56.5	120 56.4	06.8
17	286 59.7	98 48.8	49.7	165 56.9	36.5	190 19.5	56.5	135 58.7	06.7
18	302 02.2	113 48.4	S 1 50.9	180 58.2	N21 36.4	205 21.9	N22 56.5	151 00.9	N13 06.7
19	317 04.6	128 48.0	52.1	195 59.5	36.2	220 24.4	56.5	166 03.2	06.6
20	332 07.1	143 47.6	53.3	211 00.8	36.1	235 26.8	56.5	181 05.5	06.6
21	347 09.5	158 47.2	·· 54.5	226 02.1	·· 35.9	250 29.3	·· 56.5	196 07.7	·· 06.5
22	2 12.0	173 46.8	55.7	241 03.3	35.7	265 31.8	56.5	211 10.0	06.4
23	17 14.5	188 46.4	56.9	256 04.6	35.6	280 34.2	56.5	226 12.3	06.4
24 00	32 16.9	203 46.0	S 1 58.2	271 05.9	N21 35.4	295 36.7	N22 56.5	241 14.5	N13 06.3
01	47 19.4	218 45.6	1 59.4	286 07.2	35.3	310 39.1	56.5	256 16.8	06.2
02	62 21.9	233 45.3	2 00.6	301 08.5	35.1	325 41.6	56.5	271 19.1	06.2
03	77 24.3	248 44.9	·· 01.8	316 09.8	·· 34 9	340 44.1	·· 56.5	286 21.3	·· 06.1
04	92 26.8	263 44.5	03.0	331 11.1	34.8	355 46.5	56.5	301 23.6	06.0
05	107 29.3	278 44.1	04.2	346 12.4	34.6	10 49.0	56.5	316 25.9	06.0
06	122 31.7	293 43.7	S 2 05.4	1 13.6	N21 34.5	25 51.4	N22 56.5	331 28.1	N13 05.9
07	137 34.2	308 43.3	06.7	16 14.9	34.3	40 53.9	56.5	346 30.4	05.9
08	152 36.7	323 42.9	07.9	31 16.2	34.2	55 56.4	56.5	1 32.7	05.8
M 09	167 39.1	338 42.5	·· 09.1	46 17.5	·· 34.0	70 58.8	·· 56.5	16 34.9	·· 05.7
O 10	182 41.6	353 42.1	10.3	61 18.8	33.8	86 01.3	56.5	31 37.2	05.7
N 11	197 44.0	8 41.7	11.5	76 20.1	33.7	101 03.8	56.5	46 39.5	05.6
D 12	212 46.5	23 41.3	S 2 12.7	91 21.4	N21 33.5	116 06.2	N22 56.5	61 41.7	N13 05.5
A 13	227 49.0	38 40.9	13.9	106 22.7	33.4	131 08.7	56.5	76 44.0	05.5
Y 14	242 51.4	53 40.5	15.2	121 24.0	33.2	146 11.1	56.5	91 46.3	05.4
15	257 53.9	68 40.1	·· 16.4	136 25.3	·· 33.0	161 13.6	·· 56.5	106 48.5	·· 05.4
16	272 56.4	83 39.7	17.6	151 26.6	32.9	176 16.1	56.5	121 50.8	05.3
17	287 58.8	98 39.3	18.8	166 27.9	32.7	191 18.5	56.5	136 53.1	05.2
18	303 01.3	113 38.9	S 2 20.0	181 29.2	N21 32.6	206 21.0	N22 56.5	151 55.3	N13 05.2
19	318 03.8	128 38.5	21.2	196 30.5	32.4	221 23.5	56.5	166 57.6	05.1
20	333 06.2	143 38.1	22.4	211 31.8	32.2	236 25.9	56.5	181 59.9	05.0
21	348 08.7	158 37.7	·· 23.7	226 33.1	·· 32.1	251 28.4	·· 56.5	197 02.1	·· 05.0
22	3 11.1	173 37.3	24.9	241 34.4	31.9	266 30.9	56.5	212 04.4	04.9
23	18 13.6	188 36.9	26.1	256 35.7	31.8	281 33.3	56.5	227 06.7	04.9
	h m								
Mer. Pass.	21 51.2	v −0.4	d 1.2	v 1.3	d 0.2	v 2.5	d 0.0	v 2.3	d 0.1

STARS		
Name	S.H.A.	Dec
	° ′	° ′
Acamar	315 38.4	S40 23.5
Achernar	335 46.2	S57 21.0
Acrux	173 39.9	S62 58.4
Adhara	255 33.5	S28 56.4
Aldebaran	291 20.0	N16 27.9
Alioth	166 44.9	N56 04.8
Alkaid	153 20.6	N49 25.5
Al Na'ir	28 17.2	S47 04.2
Alnilam	276 13.5	S 1 12.9
Alphard	218 22.6	S 8 33.7
Alphecca	126 34.1	N26 47.6
Alpheratz	358 11.0	N28 58.3
Altair	62 34.5	N 8 48.8
Ankaa	353 41.8	S42 25.6
Antares	112 59.6	S26 22.9
Arcturus	146 20.6	N19 18.0
Atria	108 25.9	S68 59.4
Avior	234 29.0	S59 26.1
Bellatrix	279 00.6	N 6 19.8
Betelgeuse	271 30.2	N 7 24.2
Canopus	264 07.8	S52 40.8
Capella	281 13.9	N45 58.4
Deneb	49 49.7	N45 12.5
Denebola	183 01.3	N14 41.8
Diphda	349 22.6	S18 06.4
Dubhe	194 25.1	N61 52.1
Elnath	278 46.4	N28 35.2
Eltanin	90 58.9	N51 29.9
Enif	34 13.4	N 9 46.6
Fomalhaut	15 53.4	S29 44.4
Gacrux	172 31.4	S56 59.2
Gienah	176 20.3	S17 25.0
Hadar	149 26.7	S60 15.9
Hamal	328 30.8	N23 21.5
Kaus Aust.	84 19.6	S34 23.7
Kochab	137 20.2	N74 14.9
Markab	14 04.9	N15 05.4
Menkar	314 42.9	N 4 00.2
Menkent	148 39.7	S36 15.5
Miaplacidus	221 45.5	S69 37.3
Mirfak	309 18.4	N49 46.9
Nunki	76 31.7	S26 19.4
Peacock	54 01.5	S56 48.5
Pollux	244 00.5	N28 04.7
Procyon	245 27.8	N 5 16.9
Rasalhague	96 31.6	N12 34.8
Regulus	208 12.3	N12 04.5
Rigel	281 37.7	S 8 13.6
Rigil Kent.	140 29.1	S60 44.5
Sabik	102 43.6	S15 41.7
Schedar	350 10.6	N56 25.1
Shaula	96 58.7	S37 05.3
Sirius	258 57.3	S16 41.1
Spica	158 59.9	S11 02.6
Suhail	223 12.3	S43 20.4
Vega	80 57.3	N38 46.2
Zuben'ubi	137 35.5	S15 56.8

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	172 37.7	10 25
Mars	239 17.4	5 57
Jupiter	263 19.9	4 21
Saturn	209 02.4	7 57

	G.M.T.	SUN G.H.A.	SUN Dec.	MOON G.H.A.	v	MOON Dec.	d	H.P.
	d h	° ′	° ′	° ′	′	° ′	′	′
	22 00	183 51.1	S10 56.0	59 47.3	11.2	S 8 01.5	9.5	57.5
	01	198 51.2	56.9	74 17.5	11.3	7 52.0	9.6	57.5
	02	213 51.3	57.8	88 47.8	11.3	7 42.4	9.6	57.4
	03	228 51.4	·· 58.7	103 18.1	11.4	7 32.8	9.7	57.4
	04	243 51.5	10 59.6	117 48.5	11.4	7 23.1	9.7	57.4
	05	258 51.6	11 00.4	132 18.9	11.4	7 13.4	9.7	57.4
	06	273 51.7	S11 01.3	146 49.3	11.5	S 7 03.7	9.7	57.3
	07	288 51.8	02.2	161 19.8	11.5	6 54.0	9.8	57.3
S	08	303 51.9	03.1	175 50.3	11.6	6 44.2	9.8	57.3
A	09	318 52.0	·· 04.0	190 20.9	11.6	6 34.4	9.8	57.3
T	10	333 52.0	04.9	204 51.5	11.7	6 24.6	9.9	57.3
U	11	348 52.1	05.7	219 22.2	11.7	6 14.7	9.8	57.2
R	12	3 52.2	S11 06.6	233 52.9	11.7	S 6 04.9	9.9	57.2
D	13	18 52.3	07.5	248 23.6	11.8	5 55.0	10.0	57.2
A	14	33 52.4	08.4	262 54.4	11.9	5 45.0	9.9	57.2
Y	15	48 52.5	·· 09.3	277 25.3	11.8	5 35.1	10.0	57.1
	16	63 52.6	10.2	291 56.1	11.9	5 25.1	10.0	57.1
	17	78 52.7	11.0	306 27.0	12.0	5 15.1	10.0	57.1
	18	93 52.8	S11 11.9	320 58.0	12.0	S 5 05.1	10.0	57.1
	19	108 52.9	12.8	335 29.0	12.0	4 55.1	10.0	57.1
	20	123 53.0	13.7	350 00.0	12.0	4 45.1	10.1	57.0
	21	138 53.1	·· 14.6	4 31.0	12.1	4 35.0	10.1	57.0
	22	153 53.2	15.4	19 02.1	12.2	4 24.9	10.1	57.0
	23	168 53.2	16.3	33 33.3	12.1	4 14.8	10.1	57.0
	23 00	183 53.3	S11 17.2	48 04.4	12.2	S 4 04.7	10.1	56.9
	01	198 53.4	18.1	62 35.6	12.3	3 54.6	10.1	56.9
	02	213 53.5	19.0	77 06.9	12.2	3 44.5	10.2	56.9
	03	228 53.6	·· 19.8	91 38.1	12.3	3 34.3	10.1	56.9
	04	243 53.7	20.7	106 09.4	12.4	3 24.2	10.2	56.9
	05	258 53.8	21.6	120 40.8	12.3	3 14.0	10.1	56.8
	06	273 53.9	S11 22.5	135 12.1	12.4	S 3 03.9	10.2	56.8
	07	288 54.0	23.3	149 43.5	12.5	2 53.7	10.2	56.8
	08	303 54.0	24.2	164 15.0	12.4	2 43.5	10.2	56.8
S	09	318 54.1	·· 25.1	178 46.4	12.5	2 33.3	10.2	56.8
U	10	333 54.2	26.0	193 17.9	12.5	2 23.1	10.2	56.7
N	11	348 54.3	26.8	207 49.4	12.5	2 12.9	10.2	56.7
D	12	3 54.4	S11 27.7	222 20.9	12.6	S 2 02.7	10.2	56.7
A	13	18 54.5	28.6	236 52.5	12.6	1 52.5	10.2	56.7
Y	14	33 54.6	29.5	251 24.1	12.6	1 42.3	10.3	56.6
	15	48 54.7	·· 30.3	265 55.7	12.7	1 32.0	10.2	56.6
	16	63 54.7	31.2	280 27.4	12.6	1 21.8	10.2	56.6
	17	78 54.8	32.1	294 59.0	12.7	1 11.6	10.2	56.6
	18	93 54.9	S11 33.0	309 30.7	12.8	S 1 01.4	10.2	56.6
	19	108 55.0	33.8	324 02.5	12.7	0 51.2	10.2	56.5
	20	123 55.1	34.7	338 34.2	12.8	0 41.0	10.2	56.5
	21	138 55.2	·· 35.6	353 06.0	12.7	0 30.8	10.2	56.5
	22	153 55.2	36.5	7 37.7	12.9	0 20.6	10.2	56.5
	23	168 55.3	37.3	22 09.6	12.8	0 10.4	10.2	56.5
	24 00	183 55.4	S11 38.2	36 41.4	12.8	S 0 00.2	10.2	56.4
	01	198 55.5	39.1	51 13.2	12.9	N 0 10.0	10.2	56.4
	02	213 55.6	39.9	65 45.1	12.9	0 20.2	10.2	56.4
	03	228 55.7	·· 40.8	80 17.0	12.9	0 30.4	10.1	56.4
	04	243 55.7	41.7	94 48.9	12.9	0 40.5	10.2	56.4
	05	258 55.8	42.6	109 20.8	12.9	0 50.7	10.1	56.3
	06	273 55.9	S11 43.4	123 52.7	13.0	N 1 00.8	10.2	56.3
	07	288 56.0	44.3	138 24.7	13.0	1 11.0	10.1	56.3
	08	303 56.1	45.2	152 56.7	13.0	1 21.1	10.1	56.3
M	09	318 56.1	·· 46.0	167 28.7	13.0	1 31.2	10.1	56.3
O	10	333 56.2	46.9	182 00.7	13.0	1 41.3	10.0	56.2
N	11	348 56.3	47.8	196 32.7	13.0	1 51.3	10.1	56.2
D	12	3 56.4	S11 48.6	211 04.7	13.1	N 2 01.4	10.0	56.2
A	13	18 56.5	49.5	225 36.8	13.0	2 11.4	10.1	56.2
Y	14	33 56.5	50.4	240 08.8	13.1	2 21.5	10.0	56.1
	15	48 56.6	·· 51.2	254 40.9	13.1	2 31.5	10.0	56.1
	16	63 56.7	52.1	269 13.0	13.1	2 41.5	10.0	56.1
	17	78 56.8	53.0	283 45.1	13.1	2 51.5	9.9	56.1
	18	93 56.9	S11 53.8	298 17.2	13.1	N 3 01.4	9.9	56.1
	19	108 56.9	54.7	312 49.3	13.1	3 11.3	10.0	56.0
	20	123 57.0	55.6	327 21.4	13.2	3 21.3	9.8	56.0
	21	138 57.1	·· 56.4	341 53.6	13.1	3 31.1	9.9	56.0
	22	153 57.2	57.3	356 25.7	13.2	3 41.0	9.9	56.0
	23	168 57.2	58.2	10 57.9	13.1	3 50.9	9.8	56.0
		S.D. 16.1	d 0.9	S.D. 15.6		15.4		15.3

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 22	Moonrise 23	Moonrise 24	Moonrise 25
°	h m	h m	h m	h m	h m	h m	h m
N 72	05 29	06 48	08 04	15 42	15 37	15 31	15 26
N 70	05 29	06 40	07 47	15 34	15 35	15 35	15 35
68	05 29	06 34	07 34	15 28	15 33	15 38	15 43
66	05 28	06 28	07 23	15 22	15 31	15 40	15 49
64	05 28	06 23	07 14	15 18	15 30	15 42	15 54
62	05 28	06 19	07 06	15 14	15 29	15 44	15 59
60	05 27	06 16	06 59	15 10	15 28	15 45	16 03
N 58	05 26	06 12	06 53	15 07	15 27	15 47	16 06
56	05 26	06 09	06 48	15 05	15 27	15 48	16 09
54	05 25	06 06	06 43	15 02	15 26	15 49	16 12
52	05 24	06 04	06 38	15 00	15 25	15 50	16 15
50	05 24	06 01	06 35	14 58	15 25	15 51	16 17
45	05 22	05 56	06 26	14 53	15 24	15 53	16 22
N 40	05 20	05 51	06 19	14 50	15 23	15 55	16 27
35	05 17	05 47	06 13	14 46	15 22	15 56	16 30
30	05 15	05 43	06 07	14 43	15 21	15 57	16 34
20	05 09	05 35	05 58	14 38	15 20	16 00	16 40
N 10	05 03	05 28	05 49	14 34	15 18	16 02	16 45
0	04 55	05 20	05 41	14 30	15 17	16 04	16 50
S 10	04 46	05 11	05 33	14 26	15 16	16 06	16 55
20	04 35	05 01	05 24	14 21	15 15	16 08	17 00
30	04 20	04 49	05 14	14 16	15 14	16 10	17 06
35	04 10	04 42	05 08	14 13	15 13	16 12	17 09
40	03 59	04 33	05 01	14 10	15 12	16 13	17 13
45	03 44	04 22	04 53	14 06	15 11	16 15	17 18
S 50	03 26	04 09	04 44	14 02	15 10	16 17	17 23
52	03 17	04 03	04 39	14 00	15 10	16 19	17 26
54	03 06	03 56	04 34	13 57	15 09	16 20	17 29
56	02 54	03 48	04 29	13 55	15 08	16 21	17 32
58	02 40	03 39	04 23	13 52	15 08	16 22	17 36
S 60	02 23	03 28	04 16	13 49	15 07	16 24	17 39

Lat.	Sunset	Twilight Civil	Twilight Naut.	Moonset 22	Moonset 23	Moonset 24	Moonset 25
°	h m	h m	h m	h m	h m	h m	h m
N 72	15 23	16 39	17 58	00 17	02 04	03 47	05 28
N 70	15 40	16 47	17 58	00 30	02 09	03 46	05 21
68	15 54	16 53	17 58	00 40	02 14	03 45	05 15
66	16 05	16 59	17 59	00 48	02 18	03 45	05 10
64	16 14	17 04	17 59	00 56	02 21	03 44	05 06
62	16 22	17 08	18 00	01 02	02 23	03 44	05 03
60	16 29	17 12	18 01	01 07	02 26	03 44	05 00
N 58	16 35	17 16	18 01	01 11	02 28	03 43	04 57
56	16 40	17 19	18 02	01 15	02 30	03 43	04 55
54	16 45	17 21	18 03	01 19	02 32	03 43	04 53
52	16 49	17 24	18 03	01 22	02 33	03 43	04 51
50	16 53	17 27	18 04	01 25	02 34	03 42	04 49
45	17 02	17 32	18 06	01 32	02 37	03 42	04 45
N 40	17 09	17 37	18 09	01 37	02 40	03 42	04 42
35	17 16	17 41	18 11	01 42	02 42	03 41	04 39
30	17 21	17 46	18 14	01 46	02 44	03 41	04 37
20	17 31	17 53	18 19	01 53	02 47	03 41	04 33
N 10	17 40	18 01	18 26	01 59	02 50	03 40	04 29
0	17 48	18 09	18 33	02 04	02 53	03 40	04 26
S 10	17 56	18 18	18 43	02 10	02 55	03 39	04 22
20	18 05	18 28	18 54	02 16	02 58	03 39	04 19
30	18 15	18 40	19 10	02 23	03 01	03 38	04 14
35	18 21	18 48	19 19	02 27	03 03	03 38	04 12
40	18 28	18 57	19 31	02 31	03 05	03 37	04 09
45	18 36	19 08	19 46	02 36	03 07	03 37	04 06
S 50	18 46	19 21	20 05	02 42	03 10	03 36	04 02
52	18 51	19 28	20 14	02 45	03 11	03 36	04 01
54	18 56	19 35	20 24	02 48	03 13	03 36	03 59
56	19 01	19 43	20 37	02 51	03 14	03 36	03 57
58	19 08	19 52	20 51	02 55	03 16	03 35	03 55
S 60	19 15	20 03	21 09	02 59	03 18	03 35	03 52

Day	SUN Eqn. of Time 00ʰ	SUN Eqn. of Time 12ʰ	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
	m s	m s	h m	h m	h m	d	
22	15 24	15 29	11 45	20 41	08 17	10	
23	15 33	15 37	11 44	21 28	09 05	11	◐
24	15 41	15 45	11 44	22 15	09 52	12	

1977 OCTOBER 25, 26, 27 (TUES., WED., THURS.)

G.M.T.		ARIES	VENUS −3.4		MARS +0.5		JUPITER −2.1		SATURN +0.8	
		G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
d	h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
25	00	33 16.1	203 36.5	S 2 27.3	271 37.0	N21 31.6	296 35.8	N22 56.5	242 08.9	N13 04.8
	01	48 18.5	218 36.1	28.5	286 38.3	31.5	311 38.3	56.5	257 11.2	04.7
	02	63 21.0	233 35.7	29.7	301 39.6	31.3	326 40.8	56.5	272 13.5	04.7
	03	78 23.5	248 35.3	·· 30.9	316 40.9	·· 31.1	341 43.2	·· 56.5	287 15.8	·· 04.6
	04	93 25.9	263 34.9	32.2	331 42.2	31.0	356 45.7	56.5	302 18.0	04.5
	05	108 28.4	278 34.5	33.4	346 43.5	30.8	11 48.2	56.6	317 20.3	04.5
	06	123 30.9	293 34.2	S 2 34.6	1 44.8	N21 30.7	26 50.6	N22 56.6	332 22.6	N13 04.4
	07	138 33.3	308 33.8	35.8	16 46.1	30.5	41 53.1	56.6	347 24.8	04.4
TUESDAY	08	153 35.8	323 33.4	37.0	31 47.4	30.3	56 55.6	56.6	2 27.1	04.3
	09	168 38.3	338 33.0	·· 38.2	46 48.7	·· 30.2	71 58.1	·· 56.6	17 29.4	·· 04.2
	10	183 40.7	353 32.6	39.4	61 50.0	30.0	87 00.5	56.6	32 31.6	04.2
	11	198 43.2	8 32.2	40.7	76 51.3	29.9	102 03.0	56.6	47 33.9	04.1
	12	213 45.6	23 31.8	S 2 41.9	91 52.6	N21 29.7	117 05.5	N22 56.6	62 36.2	N13 04.1
	13	228 48.1	38 31.4	43.1	106 53.9	29.5	132 07.9	56.6	77 38.5	04.0
	14	243 50.6	53 31.0	44.3	121 55.2	29.4	147 10.4	56.6	92 40.7	03.9
	15	258 53.0	68 30.6	·· 45.5	136 56.5	·· 29.2	162 12.9	·· 56.6	107 43.0	·· 03.9
	16	273 55.5	83 30.2	46.7	151 57.8	29.1	177 15.4	56.6	122 45.3	03.8
	17	288 58.0	98 29.8	47.9	166 59.2	28.9	192 17.8	56.6	137 47.5	03.7
	18	304 00.4	113 29.4	S 2 49.1	182 00.5	N21 28.8	207 20.3	N22 56.6	152 49.8	N13 03.7
	19	319 02.9	128 29.0	50.4	197 01.8	28.6	222 22.8	56.6	167 52.1	03.6
	20	334 05.4	143 28.6	51.6	212 03.1	28.4	237 25.3	56.6	182 54.4	03.6
	21	349 07.8	158 28.2	·· 52.8	227 04.4	·· 28.3	252 27.8	·· 56.6	197 56.6	·· 03.5
	22	4 10.3	173 27.8	54.0	242 05.7	28.1	267 30.2	56.6	212 58.9	03.4
	23	19 12.8	188 27.4	55.2	257 07.0	28.0	282 32.7	56.6	228 01.2	03.4
26	00	34 15.2	203 27.0	S 2 56.4	272 08.3	N21 27.8	297 35.2	N22 56.6	243 03.5	N13 03.3
	01	49 17.7	218 26.6	57.6	287 09.7	27.6	312 37.7	56.6	258 05.7	03.3
	02	64 20.1	233 26.2	2 58.9	302 11.0	27.5	327 40.1	56.6	273 08.0	03.2
	03	79 22.6	248 25.8	3 00.1	317 12.3	·· 27.3	342 42.6	·· 56.6	288 10.3	·· 03.1
	04	94 25.1	263 25.4	01.3	332 13.6	27.2	357 45.1	56.6	303 12.5	03.1
	05	109 27.5	278 25.0	02.5	347 14.9	27.0	12 47.6	56.6	318 14.8	03.0
	06	124 30.0	293 24.6	S 3 03.7	2 16.2	N21 26.9	27 50.1	N22 56.6	333 17.1	N13 02.9
WEDNESDAY	07	139 32.5	308 24.2	04.9	17 17.6	26.7	42 52.5	56.6	348 19.4	02.9
	08	154 34.9	323 23.8	06.1	32 18.9	26.5	57 55.0	56.6	3 21.6	02.8
	09	169 37.4	338 23.3	·· 07.3	47 20.2	·· 26.4	72 57.5	·· 56.6	18 23.9	·· 02.8
	10	184 39.9	353 22.9	08.6	62 21.5	26.2	88 00.0	56.6	33 26.2	02.7
	11	199 42.3	8 22.5	09.8	77 22.8	26.1	103 02.5	56.6	48 28.5	02.6
	12	214 44.8	23 22.1	S 3 11.0	92 24.2	N21 25.9	118 04.9	N22 56.6	63 30.7	N13 02.6
	13	229 47.2	38 21.7	12.2	107 25.5	25.8	133 07.4	56.6	78 33.0	02.5
	14	244 49.7	53 21.3	13.4	122 26.8	25.6	148 09.9	56.7	93 35.3	02.5
	15	259 52.2	68 20.9	·· 14.6	137 28.1	·· 25.4	163 12.4	·· 56.7	108 37.6	·· 02.4
	16	274 54.6	83 20.5	15.8	152 29.5	25.3	178 14.9	56.7	123 39.8	02.3
	17	289 57.1	98 20.1	17.0	167 30.8	25.1	193 17.4	56.7	138 42.1	02.3
	18	304 59.6	113 19.7	S 3 18.3	182 32.1	N21 25.0	208 19.8	N22 56.7	153 44.4	N13 02.2
	19	320 02.0	128 19.3	19.5	197 33.4	24.8	223 22.3	56.7	168 46.7	02.2
	20	335 04.5	143 18.9	20.7	212 34.8	24.6	238 24.8	56.7	183 48.9	02.1
	21	350 07.0	158 18.5	·· 21.9	227 36.1	·· 24.5	253 27.3	·· 56.7	198 51.2	·· 02.0
	22	5 09.4	173 18.1	23.1	242 37.4	24.3	268 29.8	56.7	213 53.5	02.0
	23	20 11.9	188 17.7	24.3	257 38.7	24.2	283 32.3	56.7	228 55.8	01.9
27	00	35 14.4	203 17.3	S 3 25.5	272 40.1	N21 24.0	298 34.8	N22 56.7	243 58.0	N13 01.9
	01	50 16.8	218 16.9	26.7	287 41.4	23.9	313 37.3	56.7	259 00.3	01.8
	02	65 19.3	233 16.5	27.9	302 42.7	23.7	328 39.7	56.7	274 02.6	01.7
	03	80 21.7	248 16.1	·· 29.2	317 44.1	·· 23.5	343 42.2	·· 56.7	289 04.9	·· 01.7
	04	95 24.2	263 15.7	30.4	332 45.4	23.4	358 44.7	56.7	304 07.1	01.6
	05	110 26.7	278 15.3	31.6	347 46.7	23.2	13 47.2	56.7	319 09.4	01.6
	06	125 29.1	293 14.9	S 3 32.8	2 48.1	N21 23.1	28 49.7	N22 56.7	334 11.7	N13 01.5
	07	140 31.6	308 14.5	34.0	17 49.4	22.9	43 52.2	56.7	349 14.0	01.4
THURSDAY	08	155 34.1	323 14.1	35.2	32 50.7	22.8	58 54.7	56.7	4 16.2	01.4
	09	170 36.5	338 13.7	·· 36.4	47 52.1	·· 22.6	73 57.2	·· 56.7	19 18.5	·· 01.3
	10	185 39.0	353 13.2	37.6	62 53.4	22.4	88 59.7	56.7	34 20.8	01.3
	11	200 41.5	8 12.8	38.8	77 54.7	22.3	104 02.1	56.7	49 23.1	01.2
	12	215 43.9	23 12.4	S 3 40.1	92 56.1	N21 22.1	119 04.6	N22 56.7	64 25.4	N13 01.2
	13	230 46.4	38 12.0	41.3	107 57.4	22.0	134 07.1	56.7	79 27.6	01.1
	14	245 48.9	53 11.6	42.5	122 58.8	21.8	149 09.6	56.7	94 29.9	01.0
	15	260 51.3	68 11.2	·· 43.7	138 00.1	·· 21.7	164 12.1	·· 56.7	109 32.2	·· 01.0
	16	275 53.8	83 10.8	44.9	153 01.4	21.5	179 14.6	56.7	124 34.5	00.9
	17	290 56.2	98 10.4	46.1	168 02.8	21.3	194 17.1	56.8	139 36.7	00.9
	18	305 58.7	113 10.0	S 3 47.3	183 04.1	N21 21.2	209 19.6	N22 56.8	154 39.0	N13 00.8
	19	321 01.2	128 09.6	48.5	198 05.5	21.0	224 22.1	56.8	169 41.3	00.7
	20	336 03.6	143 09.2	49.7	213 06.8	20.9	239 24.6	56.8	184 43.6	00.7
	21	351 06.1	158 08.8	·· 51.0	228 08.1	·· 20.7	254 27.1	·· 56.8	199 45.9	·· 00.6
	22	6 08.6	173 08.4	52.2	243 09.5	20.6	269 29.6	56.8	214 48.1	00.6
	23	21 11.0	188 08.0	53.4	258 10.8	20.4	284 32.1	56.8	229 50.4	00.5
Mer. Pass.		h m 21 39.4	v −0.4	d 1.2	v 1.3	d 0.2	v 2.5	d 0.0	v 2.3	d 0.1

STARS

Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 38.4	S40 23.6
Achernar	335 46.2	S57 21.0
Acrux	173 39.9	S62 58.4
Adhara	255 33.5	S28 56.4
Aldebaran	291 20.0	N16 27.9
Alioth	166 44.9	N56 04.8
Alkaid	153 20.6	N49 25.5
Al Na'ir	28 17.3	S47 04.2
Alnilam	276 13.4	S 1 12.9
Alphard	218 22.6	S 8 33.7
Alphecca	126 34.1	N26 47.6
Alpheratz	358 11.0	N28 58.3
Altair	62 34.5	N 8 48.8
Ankaa	353 41.9	S42 25.6
Antares	112 59.6	S26 22.9
Arcturus	146 20.6	N19 18.0
Atria	108 26.0	S68 59.3
Avior	234 28.9	S59 26.1
Bellatrix	279 00.6	N 6 19.8
Betelgeuse	271 30.2	N 7 24.2
Canopus	264 07.8	S52 40.8
Capella	281 13.9	N45 58.4
Deneb	49 49.7	N45 12.5
Denebola	183 01.3	N14 41.8
Diphda	349 22.6	S18 06.4
Dubhe	194 25.1	N61 52.0
Elnath	278 46.4	N28 35.2
Eltanin	90 59.0	N51 29.9
Enif	34 13.4	N 9 46.6
Fomalhaut	15 53.4	S29 44.4
Gacrux	172 31.4	S56 59.2
Gienah	176 20.3	S17 25.0
Hadar	149 26.7	S60 15.9
Hamal	328 30.8	N23 21.5
Kaus Aust.	84 19.7	S34 23.7
Kochab	137 20.3	N74 14.9
Markab	14 04.9	N15 05.4
Menkar	314 42.9	N 4 00.2
Menkent	148 39.7	S36 15.5
Miaplacidus	221 45.4	S69 37.3
Mirfak	309 18.4	N49 46.9
Nunki	76 31.8	S26 19.4
Peacock	54 01.5	S56 48.5
Pollux	244 00.5	N28 04.7
Procyon	245 27.8	N 5 16.9
Rasalhague	96 31.6	N12 34.8
Regulus	208 12.3	N12 04.5
Rigel	281 37.7	S 8 13.6
Rigil Kent.	140 29.1	S60 44.5
Sabik	102 43.6	S15 41.7
Schedar	350 10.6	N56 25.1
Shaula	96 58.7	S37 05.3
Sirius	258 57.3	S16 41.1
Spica	158 59.9	S11 02.6
Suhail	223 12.3	S43 20.4
Vega	80 57.3	N38 46.2
Zuben'ubi	137 35.5	S15 56.8

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	169 11.7	10 26
Mars	237 53.1	5 51
Jupiter	263 20.0	4 09
Saturn	208 48.2	7 47

	G.M.T.	SUN G.H.A.	SUN Dec.	MOON G.H.A.	*v*	MOON Dec.	*d*	H.P.
d	h	° ′	° ′	° ′	′	° ′	′	′
25	00	183 57.3	S11 59.0	25 30.0	13.2	N 4 00.7	9.8	55.9
	01	198 57.4	11 59.9	40 02.2	13.2	4 10.5	9.8	55.9
	02	213 57.5	12 00.8	54 34.4	13.2	4 20.3	9.7	55.9
	03	228 57.5	·· 01.6	69 06.6	13.1	4 30.0	9.7	55.9
	04	243 57.6	02.5	83 38.7	13.2	4 39.7	9.7	55.9
	05	258 57.7	03.3	98 10.9	13.2	4 49.4	9.7	55.9
	06	273 57.8	S12 04.2	112 43.1	13.2	N 4 59.1	9.6	55.8
	07	288 57.8	05.1	127 15.3	13.3	5 08.7	9.6	55.8
T	08	303 57.9	05.9	141 47.6	13.2	5 18.3	9.6	55.8
U	09	318 58.0	·· 06.8	156 19.8	13.2	5 27.9	9.5	55.8
E	10	333 58.1	07.7	170 52.0	13.2	5 37.4	9.5	55.8
S	11	348 58.1	08.5	185 24.2	13.2	5 46.9	9.5	55.7
D	12	3 58.2	S12 09.4	199 56.4	13.2	N 5 56.4	9.4	55.7
A	13	18 58.3	10.2	214 28.6	13.3	6 05.8	9.4	55.7
Y	14	33 58.3	11.1	229 00.9	13.2	6 15.2	9.4	55.7
	15	48 58.4	·· 12.0	243 33.1	13.2	6 24.6	9.4	55.7
	16	63 58.5	12.8	258 05.3	13.2	6 34.0	9.3	55.6
	17	78 58.6	13.7	272 37.5	13.3	6 43.3	9.2	55.6
	18	93 58.6	S12 14.5	287 09.8	13.2	N 6 52.5	9.3	55.6
	19	108 58.7	15.4	301 42.0	13.2	7 01.8	9.1	55.6
	20	123 58.8	16.2	316 14.2	13.2	7 10.9	9.2	55.6
	21	138 58.8	·· 17.1	330 46.4	13.3	7 20.1	9.1	55.5
	22	153 58.9	18.0	345 18.7	13.2	7 29.2	9.1	55.5
	23	168 59.0	18.8	359 50.9	13.2	7 38.3	9.0	55.5
26	00	183 59.0	S12 19.7	14 23.1	13.2	N 7 47.3	9.0	55.5
	01	198 59.1	20.5	28 55.3	13.2	7 56.3	9.0	55.5
	02	213 59.2	21.4	43 27.5	13.2	8 05.3	8.9	55.5
	03	228 59.2	·· 22.2	57 59.7	13.2	8 14.2	8.8	55.4
	04	243 59.3	23.1	72 31.9	13.3	8 23.0	8.8	55.4
	05	258 59.4	24.0	87 04.2	13.1	8 31.8	8.8	55.4
	06	273 59.4	S12 24.8	101 36.3	13.2	N 8 40.6	8.8	55.4
W	07	288 59.5	25.7	116 08.5	13.2	8 49.4	8.6	55.4
E	08	303 59.6	26.5	130 40.7	13.2	8 58.0	8.7	55.3
D	09	318 59.6	·· 27.4	145 12.9	13.2	9 06.7	8.6	55.3
N	10	333 59.7	28.2	159 45.1	13.2	9 15.3	8.5	55.3
E	11	348 59.8	29.1	174 17.3	13.1	9 23.8	8.5	55.3
S	12	3 59.8	S12 29.9	188 49.4	13.2	N 9 32.3	8.5	55.3
D	13	18 59.9	30.8	203 21.6	13.1	9 40.8	8.3	55.3
A	14	34 00.0	31.6	217 53.7	13.2	9 49.1	8.4	55.2
Y	15	49 00.0	·· 32.5	232 25.9	13.1	9 57.5	8.3	55.2
	16	64 00.1	33.3	246 58.0	13.2	10 05.8	8.2	55.2
	17	79 00.2	34.2	261 30.2	13.1	10 14.0	8.2	55.2
	18	94 00.2	S12 35.0	276 02.3	13.1	N10 22.2	8.2	55.2
	19	109 00.3	35.9	290 34.4	13.1	10 30.4	8.1	55.2
	20	124 00.3	36.7	305 06.5	13.1	10 38.5	8.0	55.1
	21	139 00.4	·· 37.6	319 38.6	13.1	10 46.5	8.0	55.1
	22	154 00.5	38.4	334 10.7	13.1	10 54.5	7.9	55.1
	23	169 00.5	39.3	348 42.8	13.1	11 02.4	7.9	55.1
27	00	184 00.6	S12 40.1	3 14.9	13.0	N11 10.3	7.8	55.1
	01	199 00.7	41.0	17 46.9	13.1	11 18.1	7.8	55.1
	02	214 00.7	41.8	32 19.0	13.0	11 25.9	7.7	55.0
	03	229 00.8	·· 42.7	46 51.0	13.1	11 33.6	7.6	55.0
	04	244 00.8	43.5	61 23.1	13.0	11 41.2	7.6	55.0
	05	259 00.9	44.4	75 55.1	13.0	11 48.8	7.5	55.0
	06	274 00.9	S12 45.2	90 27.1	13.0	N11 56.3	7.5	55.0
	07	289 01.0	46.1	104 59.1	13.0	12 03.8	7.4	55.0
T	08	304 01.1	46.9	119 31.1	13.0	12 11.2	7.3	54.9
H	09	319 01.1	·· 47.8	134 03.1	13.0	12 18.5	7.3	54.9
U	10	334 01.2	48.6	148 35.1	13.0	12 25.8	7.3	54.9
R	11	349 01.2	49.4	163 07.1	12.9	12 33.1	7.1	54.9
S	12	4 01.3	S12 50.3	177 39.0	13.0	N12 40.2	7.1	54.9
D	13	19 01.4	51.1	192 11.0	12.9	12 47.3	7.1	54.9
A	14	34 01.4	52.0	206 42.9	12.9	12 54.4	7.0	54.8
Y	15	49 01.5	·· 52.8	221 14.8	12.9	13 01.4	6.9	54.8
	16	64 01.5	53.7	235 46.7	12.9	13 08.3	6.8	54.8
	17	79 01.6	54.5	250 18.6	12.9	13 15.1	6.8	54.8
	18	94 01.6	S12 55.3	264 50.5	12.9	N13 21.9	6.8	54.8
	19	109 01.7	56.2	279 22.4	12.9	13 28.7	6.6	54.8
	20	124 01.7	57.0	293 54.3	12.8	13 35.3	6.6	54.8
	21	139 01.8	·· 57.9	308 26.1	12.9	13 41.9	6.5	54.7
	22	154 01.8	58.7	322 58.0	12.8	13 48.4	6.5	54.7
	23	169 01.9	59.6	337 29.8	12.9	13 54.9	6.4	54.7
		S.D. 16.1	*d* 0.9	S.D. 15.2		15.1		15.0

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 25	Moonrise 26	Moonrise 27	Moonrise 28
°	h m	h m	h m	h m	h m	h m	h m
N 72	05 41	07 02	08 21	15 26	15 21	15 15	15 09
N 70	05 40	06 52	08 01	15 35	15 36	15 39	15 44
68	05 39	06 44	07 46	15 43	15 49	15 57	16 09
66	05 37	06 38	07 33	15 49	15 59	16 12	16 29
64	05 36	06 32	07 23	15 54	16 08	16 24	16 44
62	05 35	06 27	07 14	15 59	16 15	16 34	16 58
60	05 34	06 23	07 06	16 03	16 21	16 43	17 09
N 58	05 33	06 19	07 00	16 06	16 27	16 51	17 19
56	05 32	06 15	06 54	16 09	16 32	16 58	17 27
54	05 30	06 12	06 49	16 12	16 37	17 04	17 35
52	05 29	06 09	06 44	16 15	16 41	17 09	17 41
50	05 28	06 06	06 39	16 17	16 45	17 15	17 48
45	05 25	06 00	06 30	16 22	16 53	17 25	18 01
N 40	05 23	05 54	06 22	16 27	17 00	17 35	18 12
35	05 20	05 49	06 15	16 30	17 06	17 42	18 21
30	05 17	05 45	06 09	16 34	17 11	17 49	18 30
20	05 10	05 36	05 59	16 40	17 20	18 01	18 44
N 10	05 03	05 28	05 49	16 45	17 28	18 12	18 57
0	04 55	05 19	05 41	16 50	17 36	18 22	19 08
S 10	04 45	05 10	05 32	16 55	17 43	18 32	19 20
20	04 33	04 59	05 22	17 00	17 51	18 42	19 33
30	04 17	04 46	05 11	17 06	18 01	18 55	19 48
35	04 06	04 38	05 04	17 09	18 06	19 02	19 56
40	03 54	04 28	04 57	17 13	18 12	19 10	20 06
45	03 39	04 17	04 48	17 18	18 19	19 19	20 17
S 50	03 19	04 03	04 38	17 23	18 28	19 31	20 31
52	03 09	03 56	04 33	17 26	18 32	19 36	20 37
54	02 58	03 48	04 28	17 29	18 37	19 42	20 45
56	02 45	03 40	04 22	17 32	18 41	19 49	20 53
58	02 29	03 30	04 15	17 36	18 47	19 56	21 02
S 60	02 10	03 18	04 07	17 39	18 53	20 04	21 12

Lat.	Sunset	Twilight Civil	Twilight Naut.	Moonset 25	Moonset 26	Moonset 27	Moonset 28
°	h m	h m	h m	h m	h m	h m	h m
N 72	15 06	16 25	17 45	05 28	07 09	08 50	10 34
N 70	15 26	16 34	17 46	05 21	06 55	08 28	09 59
68	15 41	16 42	17 48	05 15	06 44	08 10	09 34
66	15 54	16 49	17 49	05 10	06 35	07 57	09 16
64	16 04	16 55	17 50	05 06	06 27	07 45	09 00
62	16 13	17 00	17 52	05 03	06 20	07 36	08 48
60	16 21	17 04	17 53	05 00	06 15	07 27	08 37
N 58	16 27	17 08	17 54	04 57	06 10	07 20	08 28
56	16 33	17 12	17 55	04 55	06 05	07 14	08 19
54	16 39	17 15	17 57	04 53	06 01	07 08	08 12
52	16 43	17 18	17 58	04 51	05 58	07 03	08 06
50	16 48	17 21	17 59	04 49	05 55	06 58	08 00
45	16 57	17 28	18 02	04 45	05 48	06 48	07 47
N 40	17 05	17 33	18 05	04 42	05 42	06 40	07 37
35	17 12	17 38	18 08	04 39	05 37	06 33	07 28
30	17 18	17 43	18 11	04 37	05 32	06 27	07 20
20	17 29	17 51	18 17	04 33	05 25	06 16	07 07
N 10	17 38	18 00	18 25	04 29	05 18	06 07	06 55
0	17 47	18 09	18 33	04 26	05 12	05 58	06 44
S 10	17 56	18 18	18 43	04 22	05 05	05 49	06 33
20	18 06	18 29	18 56	04 19	04 59	05 40	06 22
30	18 18	18 43	19 12	04 14	04 51	05 29	06 08
35	18 24	18 51	19 22	04 12	04 47	05 23	06 01
40	18 32	19 00	19 35	04 09	04 42	05 16	05 52
45	18 41	19 12	19 51	04 06	04 36	05 08	05 42
S 50	18 51	19 27	20 11	04 02	04 29	04 58	05 29
52	18 56	19 34	20 21	04 01	04 26	04 53	05 24
54	19 02	19 41	20 32	03 59	04 23	04 48	05 17
56	19 08	19 50	20 46	03 57	04 19	04 43	05 10
58	19 15	20 00	21 02	03 55	04 15	04 37	05 02
S 60	19 23	20 12	21 22	03 52	04 10	04 30	04 54

Day	SUN Eqn. of Time 00ʰ	SUN Eqn. of Time 12ʰ	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
	m s	m s	h m	h m	h m	d	
25	15 49	15 53	11 44	23 01	10 38	13	○
26	15 56	15 59	11 44	23 47	11 24	14	
27	16 02	16 05	11 44	24 33	12 10	15	

1977 OCTOBER 28, 29, 30 (FRI., SAT., SUN.)

	G.M.T.	ARIES G.H.A.	VENUS −3.4 G.H.A.	VENUS −3.4 Dec.	MARS +0.5 G.H.A.	MARS +0.5 Dec.	JUPITER −2.1 G.H.A.	JUPITER −2.1 Dec.	SATURN +0.8 G.H.A.	SATURN +0.8 Dec.
	d h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
	28 00	36 13.5	203 07.5	S 3 54.6	273 12.2	N21 20.2	299 34.6	N22 56.8	244 52.7	N13 00.4
	01	51 16.0	218 07.1	55.8	288 13.5	20.1	314 37.1	56.8	259 55.0	00.4
	02	66 18.4	233 06.7	57.0	303 14.9	19.9	329 39.6	56.8	274 57.3	00.3
	03	81 20.9	248 06.3	·· 58.2	318 16.2	·· 19.8	344 42.1	·· 56.8	289 59.5	·· 00.3
	04	96 23.3	263 05.9	3 59.4	333 17.6	19.6	359 44.6	56.8	305 01.8	00.2
	05	111 25.8	278 05.5	4 00.6	348 18.9	19.5	14 47.1	56.8	320 04.1	00.2
	06	126 28.3	293 05.1	S 4 01.8	3 20.3	N21 19.3	29 49.6	N22 56.8	335 06.4	N13 00.1
	07	141 30.7	308 04.7	03.0	18 21.6	19.1	44 52.0	56.8	350 08.7	00.0
	08	156 33.2	323 04.3	04.3	33 23.0	19.0	59 54.5	56.8	5 10.9	13 00.0
F	09	171 35.7	338 03.9	·· 05.5	48 24.3	·· 18.8	74 57.0	·· 56.8	20 13.2	12 59.9
R	10	186 38.1	353 03.5	06.7	63 25.7	18.7	89 59.5	56.8	35 15.5	59.9
I	11	201 40.6	8 03.0	07.9	78 27.0	18.5	105 02.0	56.8	50 17.8	59.8
D	12	216 43.1	23 02.6	S 4 09.1	93 28.4	N21 18.4	120 04.5	N22 56.8	65 20.1	N12 59.7
A	13	231 45.5	38 02.2	10.3	108 29.7	18.2	135 07.0	56.8	80 22.3	59.7
Y	14	246 48.0	53 01.8	11.5	123 31.1	18.1	150 09.6	56.8	95 24.6	59.6
	15	261 50.5	68 01.4	·· 12.7	138 32.4	·· 17.9	165 12.1	·· 56.8	110 26.9	·· 59.6
	16	276 52.9	83 01.0	13.9	153 33.8	17.7	180 14.6	56.8	125 29.2	59.5
	17	291 55.4	98 00.6	15.1	168 35.1	17.6	195 17.1	56.8	140 31.5	59.5
	18	306 57.8	113 00.2	S 4 16.3	183 36.5	N21 17.4	210 19.6	N22 56.9	155 33.7	N12 59.4
	19	322 00.3	127 59.8	17.5	198 37.8	17.3	225 22.1	56.9	170 36.0	59.3
	20	337 02.8	142 59.3	18.8	213 39.2	17.1	240 24.6	56.9	185 38.3	59.3
	21	352 05.2	157 58.9	·· 20.0	228 40.6	·· 17.0	255 27.1	·· 56.9	200 40.6	·· 59.2
	22	7 07.7	172 58.5	21.2	243 41.9	16.8	270 29.6	56.9	215 42.9	59.2
	23	22 10.2	187 58.1	22.4	258 43.3	16.7	285 32.1	56.9	230 45.2	59.1
	29 00	37 12.6	202 57.7	S 4 23.6	273 44.6	N21 16.5	300 34.6	N22 56.9	245 47.4	N12 59.1
	01	52 15.1	217 57.3	24.8	288 46.0	16.3	315 37.1	56.9	260 49.7	59.0
	02	67 17.6	232 56.9	26.0	303 47.4	16.2	330 39.6	56.9	275 52.0	58.9
	03	82 20.0	247 56.4	·· 27.2	318 48.7	·· 16.0	345 42.1	·· 56.9	290 54.3	·· 58.9
	04	97 22.5	262 56.0	28.4	333 50.1	15.9	0 44.6	56.9	305 56.6	58.8
	05	112 25.0	277 55.6	29.6	348 51.4	15.7	15 47.1	56.9	320 58.9	58.8
	06	127 27.4	292 55.2	S 4 30.8	3 52.8	N21 15.6	30 49.6	N22 56.9	336 01.1	N12 58.7
	07	142 29.9	307 54.8	32.0	18 54.2	15.4	45 52.1	56.9	351 03.4	58.7
S	08	157 32.3	322 54.4	33.2	33 55.5	15.3	60 54.6	56.9	6 05.7	58.6
A	09	172 34.8	337 54.0	·· 34.4	48 56.9	·· 15.1	75 57.1	·· 56.9	21 08.0	·· 58.5
T	10	187 37.3	352 53.5	35.6	63 58.3	14.9	90 59.7	56.9	36 10.3	58.5
U	11	202 39.7	7 53.1	36.9	78 59.6	14.8	106 02.2	56.9	51 12.6	58.4
R	12	217 42.2	22 52.7	S 4 38.1	94 01.0	N21 14.6	121 04.7	N22 56.9	66 14.8	N12 58.4
D	13	232 44.7	37 52.3	39.3	109 02.4	14.5	136 07.2	56.9	81 17.1	58.3
A	14	247 47.1	52 51.9	40.5	124 03.7	14.3	151 09.7	56.9	96 19.4	58.3
Y	15	262 49.6	67 51.5	·· 41.7	139 05.1	·· 14.2	166 12.2	·· 56.9	111 21.7	·· 58.2
	16	277 52.1	82 51.1	42.9	154 06.5	14.0	181 14.7	57.0	126 24.0	58.1
	17	292 54.5	97 50.6	44.1	169 07.8	13.9	196 17.2	57.0	141 26.3	58.1
	18	307 57.0	112 50.2	S 4 45.3	184 09.2	N21 13.7	211 19.7	N22 57.0	156 28.6	N12 58.0
	19	322 59.4	127 49.8	46.5	199 10.6	13.5	226 22.3	57.0	171 30.8	58.0
	20	338 01.9	142 49.4	47.7	214 12.0	13.4	241 24.8	57.0	186 33.1	57.9
	21	353 04.4	157 49.0	·· 48.9	229 13.3	·· 13.2	256 27.3	·· 57.0	201 35.4	·· 57.9
	22	8 06.8	172 48.6	50.1	244 14.7	13.1	271 29.8	57.0	216 37.7	57.8
	23	23 09.3	187 48.1	51.3	259 16.1	12.9	286 32.3	57.0	231 40.0	57.7
	30 00	38 11.8	202 47.7	S 4 52.5	274 17.5	N21 12.8	301 34.8	N22 57.0	246 42.3	N12 57.7
	01	53 14.2	217 47.3	53.7	289 18.8	12.6	316 37.3	57.0	261 44.6	57.6
	02	68 16.7	232 46.9	54.9	304 20.2	12.5	331 39.9	57.0	276 46.8	57.6
	03	83 19.2	247 46.5	·· 56.1	319 21.6	·· 12.3	346 42.4	·· 57.0	291 49.1	·· 57.5
	04	98 21.6	262 46.0	57.3	334 23.0	12.2	1 44.9	57.0	306 51.4	57.5
	05	113 24.1	277 45.6	58.5	349 24.3	12.0	16 47.4	57.0	321 53.7	57.4
	06	128 26.6	292 45.2	S 4 59.7	4 25.7	N21 11.8	31 49.9	N22 57.0	336 56.0	N12 57.4
	07	143 29.0	307 44.8	5 00.9	19 27.1	11.7	46 52.4	57.0	351 58.3	57.3
	08	158 31.5	322 44.4	02.1	34 28.5	11.5	61 55.0	57.0	7 00.6	57.2
S	09	173 33.9	337 43.9	·· 03.3	49 29.9	·· 11.4	76 57.5	·· 57.0	22 02.8	·· 57.2
U	10	188 36.4	352 43.5	04.5	64 31.2	11.2	92 00.0	57.0	37 05.1	57.1
N	11	203 38.9	7 43.1	05.7	79 32.6	11.1	107 02.5	57.0	52 07.4	57.1
D	12	218 41.3	22 42.7	S 5 06.9	94 34.0	N21 10.9	122 05.0	N22 57.1	67 09.7	N12 57.0
A	13	233 43.8	37 42.3	08.2	109 35.4	10.8	137 07.5	57.1	82 12.0	57.0
Y	14	248 46.3	52 41.8	09.4	124 36.8	10.6	152 10.1	57.1	97 14.3	56.9
	15	263 48.7	67 41.4	·· 10.6	139 38.2	·· 10.5	167 12.6	·· 57.1	112 16.6	·· 56.9
	16	278 51.2	82 41.0	11.8	154 39.6	10.3	182 15.1	57.1	127 18.9	56.8
	17	293 53.7	97 40.6	13.0	169 40.9	10.2	197 17.6	57.1	142 21.1	56.7
	18	308 56.1	112 40.2	S 5 14.2	184 42.3	N21 10.0	212 20.1	N22 57.1	157 23.4	N12 56.7
	19	323 58.6	127 39.7	15.4	199 43.7	09.9	227 22.7	57.1	172 25.7	56.6
	20	339 01.1	142 39.3	16.6	214 45.1	09.7	242 25.2	57.1	187 28.0	56.6
	21	354 03.5	157 38.9	·· 17.8	229 46.5	·· 09.5	257 27.7	·· 57.1	202 30.3	·· 56.5
	22	9 06.0	172 38.5	19.0	244 47.9	09.4	272 30.2	57.1	217 32.6	56.5
	23	24 08.4	187 38.0	20.2	259 49.3	09.2	287 32.8	57.1	232 34.9	56.4
	Mer. Pass.	h m 21 27.6	v −0.4	d 1.2	v 1.4	d 0.2	v 2.5	d 0.0	v 2.3	d 0.1

STARS Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 38.3	S40 23.6
Achernar	335 46.2	S57 21.0
Acrux	173 39.9	S62 58.4
Adhara	255 33.5	S28 56.4
Aldebaran	291 20.0	N16 27.9
Alioth	166 44.9	N56 04.8
Alkaid	153 20.6	N49 25.5
Al Na'ir	28 17.3	S47 04.2
Alnilam	276 13.4	S 1 12.9
Alphard	218 22.6	S 8 33.7
Alphecca	126 34.1	N26 47.6
Alpheratz	358 11.0	N28 58.3
Altair	62 34.5	N 8 48.8
Ankaa	353 41.9	S42 25.6
Antares	112 59.6	S26 22.9
Arcturus	146 20.6	N19 18.0
Atria	108 26.0	S68 59.3
Avior	234 28.9	S59 26.1
Bellatrix	279 00.6	N 6 19.8
Betelgeuse	271 30.2	N 7 24.2
Canopus	264 07.8	S52 40.9
Capella	281 13.8	N45 58.4
Deneb	49 49.7	N45 12.5
Denebola	183 01.3	N14 41.8
Diphda	349 22.6	S18 06.4
Dubhe	194 25.1	N61 52.0
Elnath	278 46.3	N28 35.2
Eltanin	90 59.0	N51 29.9
Enif	34 13.4	N 9 46.6
Fomalhaut	15 53.4	S29 44.4
Gacrux	172 31.3	S56 59.1
Gienah	176 20.2	S17 25.0
Hadar	149 26.7	S60 15.9
Hamal	328 30.8	N23 21.5
Kaus Aust.	84 19.7	S34 23.7
Kochab	137 20.3	N74 14.9
Markab	14 04.9	N15 05.4
Menkar	314 42.9	N 4 00.2
Menkent	148 39.7	S36 15.5
Miaplacidus	221 45.4	S69 37.3
Mirfak	309 18.4	N49 46.9
Nunki	76 31.8	S26 19.4
Peacock	54 01.6	S56 48.5
Pollux	244 00.5	N28 04.7
Procyon	245 27.8	N 5 16.9
Rasalhague	96 31.6	N12 34.8
Regulus	208 12.2	N12 04.5
Rigel	281 37.7	S 8 13.6
Rigil Kent.	140 29.1	S60 44.5
Sabik	102 43.6	S15 41.7
Schedar	350 10.6	N56 25.1
Shaula	96 58.7	S37 05.2
Sirius	258 57.3	S16 41.1
Spica	158 59.9	S11 02.6
Suhail	223 12.2	S43 20.4
Vega	80 57.4	N38 46.1
Zuben'ubi	137 35.5	S15 56.8

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	165 45.1	10 28
Mars	236 32.0	5 45
Jupiter	263 22.0	3 57
Saturn	208 34.8	7 36

1977 OCTOBER 28, 29, 30 (FRI., SAT., SUN.)

G.M.T.	SUN		MOON				
	G.H.A.	Dec.	G.H.A.	v	Dec.	d	H.P.
d h	° ′	° ′	° ′	′	° ′	′	′
28 00	184 02.0	S13 00.4	352 01.7	12.8	N14 01.3	6.3	54.7
01	199 02.0	01.2	6 33.5	12.8	14 07.6	6.3	54.7
02	214 02.1	02.1	21 05.3	12.8	14 13.9	6.2	54.7
03	229 02.1	·· 02.9	35 37.1	12.7	14 20.1	6.1	54.7
04	244 02.2	03.8	50 08.8	12.8	14 26.2	6.0	54.6
05	259 02.2	04.6	64 40.6	12.8	14 32.2	6.0	54.6
06	274 02.3	S13 05.4	79 12.4	12.7	N14 38.2	5.9	54.6
07	289 02.3	06.3	93 44.1	12.8	14 44.1	5.9	54.6
08	304 02.4	07.1	108 15.9	12.7	14 50.0	5.7	54.6
F 09	319 02.4	·· 07.9	122 47.6	12.7	14 55.7	5.7	54.6
R 10	334 02.5	08.8	137 19.3	12.7	15 01.4	5.7	54.6
I 11	349 02.5	09.6	151 51.0	12.7	15 07.1	5.5	54.5
D 12	4 02.6	S13 10.5	166 22.7	12.7	N15 12.6	5.5	54.5
A 13	19 02.6	11.3	180 54.4	12.6	15 18.1	5.4	54.5
Y 14	34 02.7	12.1	195 26.0	12.7	15 23.5	5.3	54.5
15	49 02.7	·· 13.0	209 57.7	12.6	15 28.8	5.3	54.5
16	64 02.8	13.8	224 29.3	12.7	15 34.1	5.2	54.5
17	79 02.8	14.6	239 01.0	12.6	15 39.3	5.1	54.5
18	94 02.9	S13 15.5	253 32.6	12.6	N15 44.4	5.0	54.5
19	109 02.9	16.3	268 04.2	12.6	15 49.4	5.0	54.5
20	124 02.9	17.1	282 35.8	12.6	15 54.4	4.9	54.4
21	139 03.0	·· 18.0	297 07.4	12.6	15 59.3	4.8	54.4
22	154 03.0	18.8	311 39.0	12.6	16 04.1	4.7	54.4
23	169 03.1	19.6	326 10.6	12.6	16 08.8	4.7	54.4
29 00	184 03.1	S13 20.5	340 42.2	12.5	N16 13.5	4.6	54.4
01	199 03.2	21.3	355 13.7	12.6	16 18.1	4.5	54.4
02	214 03.2	22.1	9 45.3	12.5	16 22.6	4.4	54.4
03	229 03.3	·· 22.9	24 16.8	12.5	16 27.0	4.4	54.4
04	244 03.3	23.8	38 48.3	12.5	16 31.4	4.3	54.4
05	259 03.4	24.6	53 19.8	12.6	16 35.7	4.2	54.3
06	274 03.4	S13 25.4	67 51.4	12.5	N16 39.9	4.1	54.3
07	289 03.4	26.3	82 22.9	12.4	16 44.0	4.0	54.3
S 08	304 03.5	27.1	96 54.3	12.5	16 48.0	4.0	54.3
A 09	319 03.5	·· 27.9	111 25.8	12.5	16 52.0	3.9	54.3
T 10	334 03.6	28.8	125 57.3	12.5	16 55.9	3.8	54.3
U 11	349 03.6	29.6	140 28.8	12.4	16 59.7	3.7	54.3
R 12	4 03.6	S13 30.4	155 00.2	12.5	N17 03.4	3.6	54.3
D 13	19 03.7	31.2	169 31.7	12.4	17 07.0	3.6	54.3
A 14	34 03.7	32.1	184 03.1	12.5	17 10.6	3.5	54.3
Y 15	49 03.8	·· 32.9	198 34.6	12.4	17 14.1	3.4	54.2
16	64 03.8	33.7	213 06.0	12.4	17 17.5	3.3	54.2
17	79 03.8	34.5	227 37.4	12.5	17 20.8	3.3	54.2
18	94 03.9	S13 35.4	242 08.9	12.4	N17 24.1	3.1	54.2
19	109 03.9	36.2	256 40.3	12.4	17 27.2	3.1	54.2
20	124 04.0	37.0	271 11.7	12.4	17 30.3	3.0	54.2
21	139 04.0	·· 37.8	285 43.1	12.4	17 33.3	2.9	54.2
22	154 04.0	38.7	300 14.5	12.3	17 36.2	2.8	54.2
23	169 04.1	39.5	314 45.8	12.4	17 39.0	2.8	54.2
30 00	184 04.1	S13 40.3	329 17.2	12.4	N17 41.8	2.7	54.2
01	199 04.1	41.1	343 48.6	12.4	17 44.5	2.6	54.2
02	214 04.2	41.9	358 20.0	12.4	17 47.1	2.5	54.2
03	229 04.2	·· 42.8	12 51.4	12.3	17 49.6	2.4	54.2
04	244 04.3	43.6	27 22.7	12.4	17 52.0	2.3	54.1
05	259 04.3	44.4	41 54.1	12.3	17 54.3	2.3	54.1
06	274 04.3	S13 45.2	56 25.4	12.4	N17 56.6	2.2	54.1
07	289 04.4	46.1	70 56.8	12.3	17 58.8	2.1	54.1
08	304 04.4	46.9	85 28.1	12.4	18 00.9	2.0	54.1
S 09	319 04.4	·· 47.7	99 59.5	12.3	18 02.9	1.9	54.1
U 10	334 04.5	48.5	114 30.8	12.4	18 04.8	1.8	54.1
N 11	349 04 5	49.3	129 02.2	12.3	18 06.6	1.8	54.1
D 12	4 04.5	S13 50.1	143 33.5	12.3	N18 08.4	1.7	54.1
A 13	19 04.6	51.0	158 04.8	12.4	18 10.1	1.5	54.1
Y 14	34 04.6	51.8	172 36.2	12.3	18 11.6	1.6	54.1
15	49 04.6	·· 52.6	187 07.5	12.3	18 13.2	1.4	54.1
16	64 04.7	53.4	201 38.8	12.4	18 14.6	1.3	54.1
17	79 04.7	54.2	216 10.2	12.3	18 15.9	1.3	54.1
18	94 04.7	S13 55.1	230 41.5	12.3	N18 17.2	1.1	54.1
19	109 04.7	55.9	245 12.8	12.3	18 18.3	1.1	54.1
20	124 04.8	56.7	259 44.1	12.4	18 19.4	1.0	54.1
21	139 04.8	·· 57.5	274 15.5	12.3	18 20.4	0.9	54.1
22	154 04.8	58.3	288 46.8	12.3	18 21.3	0.9	54.1
23	169 04.9	59.1	303 18.1	12.4	18 22.2	0.7	54.1
	S.D. 16.1	d 0.8	S.D. 14.9		14.8		14.7

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 28	Moonrise 29	Moonrise 30	Moonrise 31
°	h m	h m	h m	h m	h m	h m	h m
N 72	05 54	07 15	08 38	15 09	14 59	▭	▭
N 70	05 51	07 04	08 15	15 44	15 55	16 17	17 00
68	05 48	06 55	07 58	16 09	16 28	16 58	17 43
66	05 46	06 47	07 44	16 29	16 52	17 26	18 12
64	05 44	06 40	07 32	16 44	17 12	17 47	18 34
62	05 42	06 35	07 23	16 58	17 27	18 05	18 51
60	05 41	06 30	07 14	17 09	17 40	18 19	19 06
N 58	05 39	06 25	07 07	17 19	17 52	18 31	19 18
56	05 37	06 21	07 00	17 27	18 01	18 42	19 29
54	05 36	06 17	06 54	17 35	18 10	18 51	19 38
52	05 34	06 14	06 49	17 41	18 18	19 00	19 47
50	05 33	06 11	06 44	17 48	18 25	19 07	19 54
45	05 29	06 04	06 34	18 01	18 40	19 23	20 10
N 40	05 26	05 58	06 25	18 12	18 52	19 36	20 24
35	05 22	05 52	06 18	18 21	19 03	19 48	20 35
30	05 19	05 47	06 11	18 30	19 12	19 57	20 45
20	05 11	05 37	06 00	18 44	19 28	20 14	21 02
N 10	05 03	05 28	05 50	18 57	19 42	20 29	21 16
0	04 54	05 19	05 40	19 08	19 55	20 43	21 30
S 10	04 44	05 09	05 31	19 20	20 09	20 57	21 44
20	04 31	04 57	05 20	19 33	20 23	21 11	21 59
30	04 13	04 43	05 08	19 48	20 39	21 28	22 16
35	04 02	04 34	05 01	19 56	20 48	21 38	22 26
40	03 49	04 24	04 53	20 06	20 59	21 50	22 37
45	03 33	04 12	04 44	20 17	21 12	22 03	22 50
S 50	03 12	03 57	04 32	20 31	21 27	22 19	23 06
52	03 01	03 49	04 27	20 37	21 35	22 27	23 14
54	02 49	03 41	04 21	20 45	21 43	22 35	23 22
56	02 35	03 32	04 14	20 53	21 52	22 45	23 32
58	02 17	03 21	04 07	21 02	22 02	22 56	23 42
S 60	01 56	03 08	03 59	21 12	22 14	23 08	23 55

Lat.	Sunset	Twilight Civil	Twilight Naut.	Moonset 28	Moonset 29	Moonset 30	Moonset 31
°	h m	h m	h m	h m	h m	h m	h m
N 72	14 48	16 11	17 32	10 34	12 21	▭	▭
N 70	15 11	16 22	17 35	09 59	11 26	12 42	13 37
68	15 28	16 31	17 38	09 34	10 53	12 01	12 54
66	15 42	16 39	17 40	09 16	10 29	11 33	12 25
64	15 54	16 46	17 42	09 00	10 10	11 12	12 03
62	16 04	16 52	17 44	08 48	09 55	10 54	11 45
60	16 12	16 57	17 46	08 37	09 42	10 40	11 31
N 58	16 20	17 01	17 48	08 28	09 31	10 28	11 18
56	16 26	17 06	17 49	08 19	09 21	10 18	11 08
54	16 32	17 09	17 51	08 12	09 13	10 08	10 58
52	16 38	17 13	17 52	08 06	09 05	10 00	10 50
50	16 42	17 16	17 54	08 00	08 58	09 53	10 42
45	16 53	17 23	17 58	07 47	08 44	09 37	10 26
N 40	17 02	17 29	18 01	07 37	08 32	09 24	10 13
35	17 09	17 35	18 05	07 28	08 21	09 13	10 01
30	17 16	17 40	18 08	07 20	08 13	09 03	09 51
20	17 27	17 50	18 16	07 07	07 57	08 46	09 34
N 10	17 37	17 59	18 24	06 55	07 44	08 32	09 20
0	17 47	18 08	18 33	06 44	07 31	08 18	09 06
S 10	17 57	18 19	18 44	06 33	07 18	08 05	08 52
20	18 08	18 30	18 57	06 22	07 05	07 50	08 37
30	18 20	18 45	19 15	06 08	06 50	07 34	08 20
35	18 27	18 54	19 26	06 01	06 41	07 24	08 10
40	18 35	19 04	19 39	05 52	06 31	07 13	07 58
45	18 45	19 17	19 56	05 42	06 19	07 00	07 45
S 50	18 56	19 32	20 17	05 29	06 04	06 44	07 29
52	19 02	19 40	20 28	05 24	05 58	06 37	07 21
54	19 08	19 48	20 41	05 17	05 50	06 29	07 13
56	19 14	19 58	20 55	05 10	05 42	06 19	07 03
58	19 22	20 09	21 13	05 02	05 33	06 09	06 52
S 60	19 31	20 21	21 36	04 54	05 22	05 57	06 40

Day	SUN Eqn. of Time 00ʰ	SUN Eqn. of Time 12ʰ	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	Age	Phase
	m s	m s	h m	h m	h m	d	
28	16 08	16 10	11 44	00 33	12 56	16	○
29	16 12	16 14	11 44	01 20	13 43	17	
30	16 16	16 18	11 44	02 07	14 31	18	

G.M.T.			ARIES	VENUS −3.4		MARS +0.4		JUPITER −2.1		SATURN +0.8	
			G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
d	h		° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
31	00		39 10.9	202 37.6	S 5 21.4	274 50.7	N21 09.1	302 35.3	N22 57.1	247 37.2	N12 56.4
	01		54 13.4	217 37.2	22.6	289 52.1	08.9	317 37.8	57.1	262 39.5	56.3
	02		69 15.8	232 36.8	23.8	304 53.4	08.8	332 40.3	57.1	277 41.8	56.3
	03		84 18.3	247 36.4	·· 25.0	319 54.8	·· 08.6	347 42.9	·· 57.1	292 44.0	·· 56.2
	04		99 20.8	262 35.9	26.2	334 56.2	08.5	2 45.4	57.1	307 46.3	56.1
	05		114 23.2	277 35.5	27.4	349 57.6	08.3	17 47.9	57.1	322 48.6	56.1
	06		129 25.7	292 35.1	S 5 28.6	4 59.0	N21 08.2	32 50.4	N22 57.1	337 50.9	N12 56.0
	07		144 28.2	307 34.7	29.8	20 00.4	08.0	47 53.0	57.2	352 53.2	56.0
	08		159 30.6	322 34.2	31.0	35 01.8	07.9	62 55.5	57.2	7 55.5	55.9
	09	M	174 33.1	337 33.8	·· 32.2	50 03.2	·· 07.7	77 58.0	·· 57.2	22 57.8	·· 55.9
	10	O	189 35.5	352 33.4	33.4	65 04.6	07.6	93 00.5	57.2	38 00.1	55.8
	11	N	204 38.0	7 33.0	34.6	80 06.0	07.4	108 03.1	57.2	53 02.4	55.8
	12	D	219 40.5	22 32.5	S 5 35.8	95 07.4	N21 07.3	123 05.6	N22 57.2	68 04.7	N12 55.7
	13	A	234 42.9	37 32.1	37.0	110 08.8	07.1	138 08.1	57.2	83 06.9	55.7
	14	Y	249 45.4	52 31.7	38.2	125 10.2	07.0	153 10.6	57.2	98 09.2	55.6
	15		264 47.9	67 31.3	·· 39.3	140 11.6	·· 06.8	168 13.2	·· 57.2	113 11.5	·· 55.5
	16		279 50.3	82 30.8	40.5	155 13.0	06.7	183 15.7	57.2	128 13.8	55.5
	17		294 52.8	97 30.4	41.7	170 14.4	06.5	198 18.2	57.2	143 16.1	55.4
	18		309 55.3	112 30.0	S 5 42.9	185 15.8	N21 06.3	213 20.8	N22 57.2	158 18.4	N12 55.4
	19		324 57.7	127 29.5	44.1	200 17.2	06.2	228 23.3	57.2	173 20.7	55.3
	20		340 00.2	142 29.1	45.3	215 18.6	06.0	243 25.8	57.2	188 23.0	55.3
	21		355 02.7	157 28.7	·· 46.5	230 20.0	·· 05.9	258 28.4	·· 57.2	203 25.3	·· 55.2
	22		10 05.1	172 28.3	47.7	245 21.4	05.7	273 30.9	57.2	218 27.6	55.2
	23		25 07.6	187 27.8	48.9	260 22.8	05.6	288 33.4	57.2	233 29.9	55.1
1	00		40 10.0	202 27.4	S 5 50.1	275 24.3	N21 05.4	303 36.0	N22 57.2	248 32.2	N12 55.1
	01		55 12.5	217 27.0	51.3	290 25.7	05.3	318 38.5	57.3	263 34.5	55.0
	02		70 15.0	232 26.5	52.5	305 27.1	05.1	333 41.0	57.3	278 36.8	55.0
	03		85 17.4	247 26.1	·· 53.7	320 28.5	·· 05.0	348 43.6	·· 57.3	293 39.0	·· 54.9
	04		100 19.9	262 25.7	54.9	335 29.9	04.8	3 46.1	57.3	308 41.3	54.8
	05		115 22.4	277 25.3	56.1	350 31.3	04.7	18 48.6	57.3	323 43.6	54.8
	06		130 24.8	292 24.8	S 5 57.3	5 32.7	N21 04.5	33 51.2	N22 57.3	338 45.9	N12 54.7
	07		145 27.3	307 24.4	58.5	20 34.1	04.4	48 53.7	57.3	353 48.2	54.7
	08	T	160 29.8	322 24.0	5 59.7	35 35.5	04.2	63 56.2	57.3	8 50.5	54.6
	09	U	175 32.2	337 23.5	6 00.9	50 37.0	·· 04.1	78 58.8	·· 57.3	23 52.8	·· 54.6
	10	E	190 34.7	352 23.1	02.1	65 38.4	03.9	94 01.3	57.3	38 55.1	54.5
	11	S	205 37.2	7 22.7	03.3	80 39.8	03.8	109 03.8	57.3	53 57.4	54.5
	12	D	220 39.6	22 22.2	S 6 04.5	95 41.2	N21 03.6	124 06.4	N22 57.3	68 59.7	N12 54.4
	13	A	235 42.1	37 21.8	05.7	110 42.6	03.5	139 08.9	57.3	84 02.0	54.4
	14	Y	250 44.5	52 21.4	06.8	125 44.0	03.3	154 11.4	57.3	99 04.3	54.3
	15		265 47.0	67 20.9	·· 08.0	140 45.5	·· 03.2	169 14.0	·· 57.3	114 06.6	·· 54.3
	16		280 49.5	82 20.5	09.2	155 46.9	03.0	184 16.5	57.3	129 08.9	54.2
	17		295 51.9	97 20.1	10.4	170 48.3	02.9	199 19.1	57.3	144 11.2	54.2
	18		310 54.4	112 19.6	S 6 11.6	185 49.7	N21 02.7	214 21.6	N22 57.4	159 13.5	N12 54.1
	19		325 56.9	127 19.2	12.8	200 51.1	02.6	229 24.1	57.4	174 15.8	54.1
	20		340 59.3	142 18.8	14.0	215 52.6	02.4	244 26.7	57.4	189 18.1	54.0
	21		356 01.8	157 18.3	·· 15.2	230 54.0	·· 02.3	259 29.2	·· 57.4	204 20.4	·· 53.9
	22		11 04.3	172 17.9	16.4	245 55.4	02.1	274 31.8	57.4	219 22.6	53.9
	23		26 06.7	187 17.5	17.6	260 56.8	02.0	289 34.3	57.4	234 24.9	53.8
2	00		41 09.2	202 17.0	S 6 18.8	275 58.2	N21 01.8	304 36.8	N22 57.4	249 27.2	N12 53.8
	01		56 11.6	217 16.6	20.0	290 59.7	01.7	319 39.4	57.4	264 29.5	53.7
	02		71 14.1	232 16.2	21.2	306 01.1	01.5	334 41.9	57.4	279 31.8	53.7
	03		86 16.6	247 15.7	·· 22.3	321 02.5	·· 01.4	349 44.5	·· 57.4	294 34.1	·· 53.6
	04		101 19.0	262 15.3	23.5	336 03.9	01.2	4 47.0	57.4	309 36.4	53.6
	05		116 21.5	277 14.9	24.7	351 05.4	01.1	19 49.6	57.4	324 38.7	53.5
	06		131 24.0	292 14.4	S 6 25.9	6 06.8	N21 00.9	34 52.1	N22 57.4	339 41.0	N12 53.5
	07	W	146 26.4	307 14.0	27.1	21 08.2	00.8	49 54.6	57.4	354 43.3	53.4
	08	E	161 28.9	322 13.6	28.3	36 09.7	00.6	64 57.2	57.4	9 45.6	53.4
	09	D	176 31.4	337 13.1	·· 29.5	51 11.1	·· 00.5	79 59.7	·· 57.4	24 47.9	·· 53.3
	10	N	191 33.8	352 12.7	30.7	66 12.5	00.3	95 02.3	57.5	39 50.2	53.3
	11	E	206 36.3	7 12.2	31.9	81 14.0	00.2	110 04.8	57.5	54 52.5	53.2
	12	S	221 38.8	22 11.8	S 6 33.1	96 15.4	N21 00.1	125 07.4	N22 57.5	69 54.8	N12 53.2
	13	D	236 41.2	37 11.4	34.2	111 16.8	20 59.9	140 09.9	57.5	84 57.1	53.1
	14	A	251 43.7	52 10.9	35.4	126 18.3	59.8	155 12.5	57.5	99 59.4	53.1
	15	Y	266 46.1	67 10.5	·· 36.6	141 19.7	·· 59.6	170 15.0	·· 57.5	115 01.7	·· 53.0
	16		281 48.6	82 10.0	37.8	156 21.1	59.5	185 17.6	57.5	130 04.0	53.0
	17		296 51.1	97 09.6	39.0	171 22.6	59.3	200 20.1	57.5	145 06.3	52.9
	18		311 53.5	112 09.2	S 6 40.2	186 24.0	N20 59.2	215 22.7	N22 57.5	160 08.6	N12 52.9
	19		326 56.0	127 08.7	41.4	201 25.4	59.0	230 25.2	57.5	175 10.9	52.8
	20		341 58.5	142 08.3	42.6	216 26.9	58.9	245 27.8	57.5	190 13.2	52.8
	21		357 00.9	157 07.8	·· 43.7	231 28.3	·· 58.7	260 30.3	·· 57.5	205 15.5	·· 52.7
	22		12 03.4	172 07.4	44.9	246 29.7	58.6	275 32.9	57.5	220 17.8	52.7
	23		27 05.9	187 07.0	46.1	261 31.2	58.4	290 35.4	57.5	235 20.1	52.6
Mer. Pass.			h m 21 15.8	v −0.4	d 1.2	v 1.4	d 0.2	v 2.5	d 0.0	v 2.3	d 0.1

STARS

Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 38.3	S40 23.6
Achernar	335 46.2	S57 21.0
Acrux	173 39.9	S62 58.4
Adhara	255 33.5	S28 56.4
Aldebaran	291 19.9	N16 27.9
Alioth	166 44.8	N56 04.7
Alkaid	153 20.6	N49 25.5
Al Na'ir	28 17.3	S47 04.2
Alnilam	276 13.4	S 1 12.9
Alphard	218 22.5	S 8 33.7
Alphecca	126 34.1	N26 47.5
Alpheratz	358 11.0	N28 58.3
Altair	62 34.5	N 8 48.8
Ankaa	353 41.9	S42 25.6
Antares	112 59.6	S26 22.9
Arcturus	146 20.6	N19 18.0
Atria	108 26.0	S68 59.3
Avior	234 28.9	S59 26.1
Bellatrix	279 00.6	N 6 19.8
Betelgeuse	271 30.2	N 7 24.2
Canopus	264 07.8	S52 40.9
Capella	281 13.8	N45 58.4
Deneb	49 49.8	N45 12.5
Denebola	183 01.3	N14 41.8
Diphda	349 22.6	S18 06.4
Dubhe	194 25.0	N61 52.0
Elnath	278 46.3	N28 35.3
Eltanin	90 59.0	N51 29.9
Enif	34 13.4	N 9 46.6
Fomalhaut	15 53.4	S29 44.4
Gacrux	172 31.3	S56 59.1
Gienah	176 20.2	S17 25.0
Hadar	149 26.7	S60 15.8
Hamal	328 30.8	N23 21.6
Kaus Aust.	84 19.7	S34 23.7
Kochab	137 20.3	N74 14.9
Markab	14 04.9	N15 05.4
Menkar	314 42.9	N 4 00.2
Menkent	148 39.7	S36 15.5
Miaplacidus	221 45.3	S69 37.3
Mirfak	309 18.4	N49 46.9
Nunki	76 31.8	S26 19.4
Peacock	54 01.6	S56 48.5
Pollux	244 00.5	N28 04.7
Procyon	245 27.7	N 5 16.9
Rasalhague	96 31.7	N12 34.8
Regulus	208 12.2	N12 04.5
Rigel	281 37.6	S 8 13.6
Rigil Kent.	140 29.0	S60 44.5
Sabik	102 43.6	S15 41.7
Schedar	350 10.6	N56 25.2
Shaula	96 58.7	S37 05.2
Sirius	258 57.3	S16 41.1
Spica	158 59.9	S11 02.6
Suhail	223 12.2	S43 20.4
Vega	80 57.4	N38 46.1
Zuben'ubi	137 35.5	S15 56.8

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	162 17.4	10 30
Mars	235 14.2	5 38
Jupiter	263 25.9	3 45
Saturn	208 22.1	7 25

G.M.T.		SUN		MOON				
		G.H.A.	Dec.	G.H.A.	v	Dec.	d	H.P.
d	h	° ′	° ′	° ′	′	° ′	′	′
31	00	184 04.9	S13 59.9	317 49.5	12.3	N18 22.9	0.7	54.1
	01	199 04.9	14 00.8	332 20.8	12.3	18 23.6	0.6	54.1
	02	214 05.0	01.6	346 52.1	12.3	18 24.2	0.5	54.1
	03	229 05.0	·· 02.4	1 23.4	12.4	18 24.7	0.4	54.1
	04	244 05.0	03.2	15 54.8	12.3	18 25.1	0.3	54.1
	05	259 05.0	04.0	30 26.1	12.3	18 25.4	0.2	54.1
	06	274 05.1	S14 04.8	44 57.4	12.4	N18 25.6	0.2	54.1
	07	289 05.1	05.6	59 28.8	12.3	18 25.8	0.1	54.1
	08	304 05.1	06.4	74 00.1	12.4	18 25.9	0.0	54.1
M	09	319 05.1	·· 07.2	88 31.5	12.3	18 25.9	0.1	54.1
O	10	334 05.2	08.1	103 02.8	12.4	18 25.8	0.2	54.1
N	11	349 05.2	08.9	117 34.2	12.3	18 25.6	0.3	54.1
D	12	4 05.2	S14 09.7	132 05.5	12.4	N18 25.3	0.3	54.1
A	13	19 05.2	10.5	146 36.9	12.3	18 25.0	0.4	54.1
Y	14	34 05.3	11.3	161 08.2	12.4	18 24.6	0.6	54.1
	15	49 05.3	·· 12.1	175 39.6	12.4	18 24.0	0.6	54.1
	16	64 05.3	12.9	190 11.0	12.3	18 23.4	0.6	54.1
	17	79 05.3	13.7	204 42.3	12.4	18 22.8	0.8	54.1
	18	94 05.4	S14 14.5	219 13.7	12.4	N18 22.0	0.9	54.1
	19	109 05.4	15.3	233 45.1	12.4	18 21.1	0.9	54.1
	20	124 05.4	16.1	248 16.5	12.4	18 20.2	1.0	54.1
	21	139 05.4	·· 16.9	262 47.9	12.4	18 19.2	1.1	54.1
	22	154 05.4	17.7	277 19.3	12.4	18 18.1	1.2	54.1
	23	169 05.5	18.5	291 50.7	12.4	18 16.9	1.3	54.1
1	00	184 05.5	S14 19.3	306 22.1	12.4	N18 15.6	1.3	54.1
	01	199 05.5	20.2	320 53.5	12.4	18 14.3	1.5	54.1
	02	214 05.5	21.0	335 24.9	12.5	18 12.8	1.5	54.1
	03	229 05.5	·· 21.8	349 56.4	12.4	18 11.3	1.6	54.1
	04	244 05.6	22.6	4 27.8	12.4	18 09.7	1.7	54.1
	05	259 05.6	23.4	18 59.2	12.5	18 08.0	1.8	54.1
	06	274 05.6	S14 24.2	33 30.7	12.4	N18 06.2	1.8	54.1
	07	289 05.6	25.0	48 02.1	12.5	18 04.4	1.9	54.1
	08	304 05.6	25.8	62 33.6	12.5	18 02.5	2.1	54.1
T	09	319 05.6	·· 26.6	77 05.1	12.4	18 00.4	2.1	54.1
U	10	334 05.7	27.4	91 36.5	12.5	17 58.3	2.1	54.1
E	11	349 05.7	28.2	106 08.0	12.5	17 56.2	2.3	54.1
S	12	4 05.7	S14 29.0	120 39.5	12.5	N17 53.9	2.4	54.2
D	13	19 05.7	29.8	135 11.0	12.5	17 51.5	2.4	54.2
A	14	34 05.7	30.6	149 42.5	12.5	17 49.1	2.5	54.2
Y	15	49 05.7	·· 31.4	164 14.0	12.6	17 46.6	2.6	54.2
	16	64 05.8	32.2	178 45.6	12.5	17 44.0	2.7	54.2
	17	79 05.8	33.0	193 17.1	12.5	17 41.3	2.7	54.2
	18	94 05.8	S14 33.8	207 48.6	12.6	N17 38.6	2.8	54.2
	19	109 05.8	34.6	222 20.2	12.5	17 35.8	3.0	54.2
	20	124 05.8	35.4	236 51.7	12.6	17 32.8	3.0	54.2
	21	139 05.8	·· 36.1	251 23.3	12.6	17 29.8	3.0	54.2
	22	154 05.8	36.9	265 54.9	12.6	17 26.8	3.2	54.2
	23	169 05.8	37.7	280 26.5	12.5	17 23.6	3.2	54.3
2	00	184 05.9	S14 38.5	294 58.0	12.6	N17 20.4	3.3	54.3
	01	199 05.9	39.3	309 29.6	12.6	17 17.1	3.4	54.3
	02	214 05.9	40.1	324 01.2	12.7	17 13.7	3.5	54.3
	03	229 05.9	·· 40.9	338 32.9	12.6	17 10.2	3.6	54.3
	04	244 05.9	41.7	353 04.5	12.6	17 06.6	3.6	54.3
	05	259 05.9	42.5	7 36.1	12.7	17 03.0	3.7	54.3
	06	274 05.9	S14 43.3	22 07.8	12.6	N16 59.3	3.8	54.3
W	07	289 05.9	44.1	36 39.4	12.7	16 55.5	3.9	54.3
E	08	304 05.9	44.9	51 11.1	12.6	16 51.6	3.9	54.4
D	09	319 05.9	·· 45.7	65 42.7	12.7	16 47.7	4.0	54.4
N	10	334 06.0	46.5	80 14.4	12.7	16 43.7	4.2	54.4
E	11	349 06.0	47.2	94 46.1	12.7	16 39.5	4.1	54.4
S	12	4 06.0	S14 48.0	109 17.8	12.7	N16 35.4	4.3	54.4
D	13	19 06.0	48.8	123 49.5	12.7	16 31.1	4.3	54.4
A	14	34 06.0	49.6	138 21.2	12.7	16 26.8	4.4	54.4
Y	15	49 06.0	·· 50.4	152 52.9	12.7	16 22.4	4.5	54.5
	16	64 06.0	51.2	167 24.6	12.8	16 17.9	4.6	54.5
	17	79 06.0	52.0	181 56.4	12.7	16 13.3	4.6	54.5
	18	94 06.0	S14 52.8	196 28.1	12.8	N16 08.7	4.7	54.5
	19	109 06.0	53.5	210 59.9	12.7	16 04.0	4.8	54.5
	20	124 06.0	54.3	225 31.6	12.8	15 59.2	4.9	54.5
	21	139 06.0	·· 55.1	240 03.4	12.8	15 54.3	4.9	54.5
	22	154 06.0	55.9	254 35.2	12.7	15 49.4	5.1	54.6
	23	169 06.0	56.7	269 06.9	12.8	15 44.3	5.0	54.6
		S.D. 16.1	d 0.8	S.D. 14.7		14.8		14.8

Lat.	Twilight		Sunrise	Moonrise			
	Naut.	Civil		31	1	2	3
°	h m	h m	h m	h m	h m	h m	h m
N 72	06 06	07 29	08 56	☐	16 57	18 48	20 33
N 70	06 02	07 16	08 30	17 00	18 08	19 30	21 00
68	05 58	07 05	08 10	17 43	18 45	19 59	21 20
66	05 55	06 56	07 55	18 12	19 11	20 20	21 36
64	05 52	06 49	07 42	18 34	19 31	20 37	21 49
62	05 50	06 42	07 31	18 51	19 47	20 51	22 00
60	05 47	06 37	07 22	19 06	20 01	21 02	22 10
N 58	05 45	06 32	07 14	19 18	20 12	21 13	22 18
56	05 43	06 27	07 07	19 29	20 22	21 21	22 25
54	05 41	06 23	07 00	19 38	20 31	21 29	22 32
52	05 39	06 19	06 55	19 47	20 39	21 36	22 37
50	05 37	06 15	06 49	19 54	20 46	21 43	22 43
45	05 33	06 08	06 38	20 10	21 02	21 56	22 54
N 40	05 29	06 01	06 29	20 24	21 14	22 07	23 03
35	05 25	05 55	06 21	20 35	21 25	22 17	23 11
30	05 21	05 49	06 14	20 45	21 34	22 25	23 18
20	05 13	05 39	06 01	21 02	21 50	22 40	23 30
N 10	05 04	05 29	05 51	21 16	22 04	22 52	23 41
0	04 54	05 19	05 40	21 30	22 17	23 04	23 51
S 10	04 43	05 08	05 30	21 44	22 30	23 16	24 00
20	04 29	04 56	05 19	21 59	22 44	23 28	24 11
30	04 10	04 40	05 06	22 16	23 00	23 43	24 23
35	03 59	04 31	04 58	22 26	23 10	23 51	24 30
40	03 45	04 20	04 49	22 37	23 20	24 00	00 00
45	03 27	04 07	04 39	22 50	23 33	24 11	00 11
S 50	03 05	03 51	04 27	23 06	23 48	24 25	00 25
52	02 53	03 43	04 21	23 14	23 55	24 31	00 31
54	02 40	03 34	04 15	23 22	24 03	00 03	00 38
56	02 25	03 24	04 08	23 32	24 11	00 11	00 45
58	02 06	03 12	04 00	23 42	24 21	00 21	00 54
S 60	01 41	02 59	03 50	23 55	24 33	00 33	01 04

Lat.	Sunset	Twilight		Moonset			
		Civil	Naut.	31	1	2	3
°	h m	h m	h m	h m	h m	h m	h m
N 72	14 30	15 57	17 20	☐	15 18	15 04	14 57
N 70	14 56	16 10	17 24	13 37	14 07	14 22	14 29
68	15 16	16 21	17 28	12 54	13 30	13 53	14 07
66	15 31	16 30	17 31	12 25	13 03	13 31	13 51
64	15 44	16 37	17 34	12 03	12 43	13 14	13 37
62	15 55	16 44	17 37	11 45	12 27	12 59	13 25
60	16 05	16 50	17 39	11 31	12 13	12 47	13 15
N 58	16 13	16 55	17 41	11 18	12 01	12 37	13 06
56	16 20	16 59	17 43	11 08	11 51	12 28	12 59
54	16 26	17 04	17 45	10 58	11 42	12 19	12 52
52	16 32	17 08	17 47	10 50	11 34	12 12	12 46
50	16 37	17 11	17 49	10 42	11 26	12 05	12 40
45	16 48	17 19	17 54	10 26	11 11	11 51	12 28
N 40	16 58	17 26	17 58	10 13	10 58	11 40	12 18
35	17 06	17 32	18 02	10 01	10 47	11 30	12 10
30	17 13	17 38	18 06	09 51	10 37	11 21	12 02
20	17 26	17 48	18 14	09 34	10 21	11 06	11 49
N 10	17 37	17 58	18 23	09 20	10 06	10 52	11 37
0	17 47	18 08	18 33	09 06	09 53	10 40	11 27
S 10	17 58	18 19	18 45	08 52	09 39	10 27	11 16
20	18 09	18 32	18 59	08 37	09 25	10 14	11 04
30	18 22	18 47	19 17	08 20	09 08	09 59	10 51
35	18 30	18 57	19 29	08 10	08 59	09 50	10 43
40	18 39	19 08	19 43	07 58	08 47	09 39	10 34
45	18 49	19 21	20 01	07 45	08 34	09 27	10 24
S 50	19 01	19 38	20 24	07 29	08 18	09 13	10 11
52	19 07	19 46	20 36	07 21	08 11	09 06	10 05
54	19 14	19 55	20 49	07 13	08 03	08 58	09 58
56	19 21	20 05	21 05	07 03	07 53	08 50	09 51
58	19 29	20 17	21 25	06 52	07 43	08 40	09 43
S 60	19 39	20 31	21 51	06 40	07 30	08 29	09 34

Day	SUN			MOON			
	Eqn. of Time 00ʰ	Eqn. of Time 12ʰ	Mer. Pass.	Mer. Pass. Upper	Mer. Pass. Lower	Age	Phase
	m s	m s	h m	h m	h m	d	
31	16 20	16 21	11 44	02 54	15 18	19	◑
1	16 22	16 23	11 44	03 42	16 05	20	
2	16 23	16 24	11 44	04 29	16 52	21	

1977 NOVEMBER 3, 4, 5 (THURS., FRI., SAT.)

	G.M.T.	ARIES	VENUS −3.4		MARS +0.4		JUPITER −2.1		SATURN +0.8	
		G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
	d h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
	3 00	42 08.3	202 06.5	S 6 47.3	276 32.6	N20 58.3	305 38.0	N22 57.5	250 22.4	N12 52.6
	01	57 10.8	217 06.1	48.5	291 34.1	58.1	320 40.5	57.5	265 24.7	52.5
	02	72 13.3	232 05.6	49.7	306 35.5	58.0	335 43.1	57.6	280 27.0	52.5
	03	87 15.7	247 05.2	·· 50.9	321 37.0	·· 57.8	350 45.6	·· 57.6	295 29.3	·· 52.4
	04	102 18.2	262 04.8	52.0	336 38.4	57.7	5 48.2	57.6	310 31.6	52.4
	05	117 20.6	277 04.3	53.2	351 39.8	57.5	20 50.7	57.6	325 33.9	52.3
	06	132 23.1	292 03.9	S 6 54.4	6 41.3	N20 57.4	35 53.3	N22 57.6	340 36.2	N12 52.2
	07	147 25.6	307 03.4	55.6	21 42.7	57.3	50 55.8	57.6	355 38.5	52.2
T	08	162 28.0	322 03.0	56.8	36 44.2	57.1	65 58.4	57.6	10 40.8	52.1
H	09	177 30.5	337 02.5	·· 58.0	51 45.6	·· 57.0	81 00.9	·· 57.6	25 43.1	·· 52.1
U	10	192 33.0	352 02.1	6 59.2	66 47.1	56.8	96 03.5	57.6	40 45.4	52.0
R	11	207 35.4	7 01.7	7 00.3	81 48.5	56.7	111 06.0	57.6	55 47.7	52.0
S	12	222 37.9	22 01.2	S 7 01.5	96 50.0	N20 56.5	126 08.6	N22 57.6	70 50.0	N12 51.9
D	13	237 40.4	37 00.8	02.7	111 51.4	56.4	141 11.1	57.6	85 52.3	51.9
A	14	252 42.8	52 00.3	03.9	126 52.9	56.2	156 13.7	57.6	100 54.6	51.8
Y	15	267 45.3	66 59.9	·· 05.1	141 54.3	·· 56.1	171 16.3	·· 57.6	115 56.9	·· 51.8
	16	282 47.7	81 59.4	06.3	156 55.8	55.9	186 18.8	57.6	130 59.2	51.7
	17	297 50.2	96 59.0	07.4	171 57.2	55.8	201 21.4	57.7	146 01.5	51.7
	18	312 52.7	111 58.5	S 7 08.6	186 58.7	N20 55.6	216 23.9	N22 57.7	161 03.8	N12 51.6
	19	327 55.1	126 58.1	09.8	202 00.1	55.5	231 26.5	57.7	176 06.1	51.6
	20	342 57.6	141 57.6	11.0	217 01.6	55.4	246 29.0	57.7	191 08.4	51.5
	21	358 00.1	156 57.2	·· 12.2	232 03.1	·· 55.2	261 31.6	·· 57.7	206 10.7	·· 51.5
	22	13 02.5	171 56.8	13.3	247 04.5	55.1	276 34.2	57.7	221 13.0	51.4
	23	28 05.0	186 56.3	14.5	262 06.0	54.9	291 36.7	57.7	236 15.3	51.4
	4 00	43 07.5	201 55.9	S 7 15.7	277 07.4	N20 54.8	306 39.3	N22 57.7	251 17.6	N12 51.3
	01	58 09.9	216 55.4	16.9	292 08.9	54.6	321 41.8	57.7	266 20.0	51.3
	02	73 12.4	231 55.0	18.1	307 10.3	54.5	336 44.4	57.7	281 22.3	51.2
	03	88 14.9	246 54.5	·· 19.2	322 11.8	·· 54.3	351 47.0	·· 57.7	296 24.6	·· 51.2
	04	103 17.3	261 54.1	20.4	337 13.3	54.2	6 49.5	57.7	311 26.9	51.2
	05	118 19.8	276 53.6	21.6	352 14.7	54.1	21 52.1	57.7	326 29.2	51.1
	06	133 22.2	291 53.2	S 7 22.8	7 16.2	N20 53.9	36 54.6	N22 57.7	341 31.5	N12 51.1
	07	148 24.7	306 52.7	24.0	22 17.7	53.8	51 57.2	57.8	356 33.8	51.0
	08	163 27.2	321 52.3	25.1	37 19.1	53.6	66 59.8	57.8	11 36.1	51.0
F	09	178 29.6	336 51.8	·· 26.3	52 20.6	·· 53.5	82 02.3	·· 57.8	26 38.4	·· 50.9
R	10	193 32.1	351 51.4	27.5	67 22.0	53.3	97 04.9	57.8	41 40.7	50.9
I	11	208 34.6	6 50.9	28.7	82 23.5	53.2	112 07.5	57.8	56 43.0	50.8
D	12	223 37.0	21 50.5	S 7 29.9	97 25.0	N20 53.0	127 10.0	N22 57.8	71 45.3	N12 50.8
A	13	238 39.5	36 50.0	31.0	112 26.4	52.9	142 12.6	57.8	86 47.6	50.7
Y	14	253 42.0	51 49.6	32.2	127 27.9	52.8	157 15.2	57.8	101 49.9	50.7
	15	268 44.4	66 49.1	·· 33.4	142 29.4	·· 52.6	172 17.7	·· 57.8	116 52.2	·· 50.6
	16	283 46.9	81 48.6	34.6	157 30.9	52.5	187 20.3	57.8	131 54.5	50.6
	17	298 49.4	96 48.2	35.7	172 32.3	52.3	202 22.8	57.8	146 56.8	50.5
	18	313 51.8	111 47.7	S 7 36.9	187 33.8	N20 52.2	217 25.4	N22 57.8	161 59.1	N12 50.5
	19	328 54.3	126 47.3	38.1	202 35.3	52.0	232 28.0	57.8	177 01.4	50.4
	20	343 56.7	141 46.8	39.3	217 36.7	51.9	247 30.5	57.8	192 03.8	50.4
	21	358 59.2	156 46.4	·· 40.4	232 38.2	·· 51.8	262 33.1	·· 57.9	207 06.1	·· 50.3
	22	14 01.7	171 45.9	41.6	247 39.7	51.6	277 35.7	57.9	222 08.4	50.3
	23	29 04.1	186 45.5	42.8	262 41.2	51.5	292 38.3	57.9	237 10.7	50.2
	5 00	44 06.6	201 45.0	S 7 44.0	277 42.6	N20 51.3	307 40.8	N22 57.9	252 13.0	N12 50.2
	01	59 09.1	216 44.6	45.1	292 44.1	51.2	322 43.4	57.9	267 15.3	50.1
	02	74 11.5	231 44.1	46.3	307 45.6	51.0	337 46.0	57.9	282 17.6	50.1
	03	89 14.0	246 43.7	·· 47.5	322 47.1	·· 50.9	352 48.5	·· 57.9	297 19.9	·· 50.0
	04	104 16.5	261 43.2	48.7	337 48.6	50.8	7 51.1	57.9	312 22.2	50.0
	05	119 18.9	276 42.7	49.8	352 50.0	50.6	22 53.7	57.9	327 24.5	49.9
	06	134 21.4	291 42.3	S 7 51.0	7 51.5	N20 50.5	37 56.2	N22 57.9	342 26.8	N12 49.9
	07	149 23.8	306 41.8	52.2	22 53.0	50.3	52 58.8	57.9	357 29.1	49.8
S	08	164 26.3	321 41.4	53.3	37 54.5	50.2	68 01.4	57.9	12 31.4	49.8
A	09	179 28.8	336 40.9	·· 54.5	52 56.0	·· 50.1	83 04.0	·· 57.9	27 33.8	·· 49.7
T	10	194 31.2	351 40.5	55.7	67 57.4	49.9	98 06.5	58.0	42 36.1	49.7
U	11	209 33.7	6 40.0	56.9	82 58.9	49.8	113 09.1	58.0	57 38.4	49.6
R	12	224 36.2	21 39.5	S 7 58.0	98 00.4	N20 49.6	128 11.7	N22 58.0	72 40.7	N12 49.6
D	13	239 38.6	36 39.1	7 59.2	113 01.9	49.5	143 14.2	58.0	87 43.0	49.6
A	14	254 41.1	51 38.6	8 00.4	128 03.4	49.3	158 16.8	58.0	102 45.3	49.5
Y	15	269 43.6	66 38.2	·· 01.5	143 04.9	·· 49.2	173 19.4	·· 58.0	117 47.6	·· 49.5
	16	284 46.0	81 37.7	02.7	158 06.4	49.1	188 22.0	58.0	132 49.9	49.4
	17	299 48.5	96 37.2	03.9	173 07.8	48.9	203 24.5	58.0	147 52.2	49.4
	18	314 51.0	111 36.8	S 8 05.0	188 09.3	N20 48.8	218 27.1	N22 58.0	162 54.5	N12 49.3
	19	329 53.4	126 36.3	06.2	203 10.8	48.6	233 29.7	58.0	177 56.9	49.3
	20	344 55.9	141 35.9	07.4	218 12.3	48.5	248 32.3	58.0	192 59.2	49.2
	21	359 58.3	156 35.4	·· 08.6	233 13.8	·· 48.4	263 34.8	·· 58.0	208 01.5	·· 49.2
	22	15 00.8	171 34.9	09.7	248 15.3	48.2	278 37.4	58.0	223 03.8	49.1
	23	30 03.3	186 34.5	10.9	263 16.8	48.1	293 40.0	58.1	238 06.1	49.1
	Mer. Pass.	h m 21 04.0	*v* −0.5	*d* 1.2	*v* 1.5	*d* 0.1	*v* 2.6	*d* 0.0	*v* 2.3	*d* 0.0

STARS

Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 38.3	S40 23.6
Achernar	335 46.2	S57 21.0
Acrux	173 39.8	S62 58.4
Adhara	255 33.4	S28 56.4
Aldebaran	291 19.9	N16 27.9
Alioth	166 44.8	N56 04.7
Alkaid	153 20.6	N49 25.4
Al Na'ir	28 17.3	S47 04.2
Alnilam	276 13.4	S 1 12.9
Alphard	218 22.5	S 8 33.7
Alphecca	126 34.1	N26 47.5
Alpheratz	358 11.0	N28 58.3
Altair	62 34.5	N 8 48.8
Ankaa	353 41.9	S42 25.6
Antares	112 59.6	S26 22.9
Arcturus	146 20.6	N19 18.0
Atria	108 26.0	S68 59.3
Avior	234 28.8	S59 26.1
Bellatrix	279 00.6	N 6 19.8
Betelgeuse	271 30.2	N 7 24.2
Canopus	264 07.7	S52 40.9
Capella	281 13.8	N45 58.4
Deneb	49 49.8	N45 12.5
Denebola	183 01.3	N14 41.8
Diphda	349 22.6	S18 06.5
Dubhe	194 25.0	N61 52.0
Elnath	278 46.3	N28 35.3
Eltanin	90 59.0	N51 29.9
Enif	34 13.4	N 9 46.6
Fomalhaut	15 53.4	S29 44.4
Gacrux	172 31.3	S56 59.1
Gienah	176 20.2	S17 25.0
Hadar	149 26.7	S60 15.8
Hamal	328 30.8	N23 21.6
Kaus Aust.	84 19.7	S34 23.7
Kochab	137 20.3	N74 14.9
Markab	14 04.9	N15 05.4
Menkar	314 42.8	N 4 00.2
Menkent	148 39.7	S36 15.5
Miaplacidus	221 45.3	S69 37.3
Mirfak	309 18.3	N49 46.9
Nunki	76 31.8	S26 19.4
Peacock	54 01.6	S56 48.5
Pollux	244 00.4	N28 04.7
Procyon	245 27.7	N 5 16.9
Rasalhague	96 31.7	N12 34.8
Regulus	208 12.2	N12 04.5
Rigel	281 37.6	S 8 13.6
Rigil Kent.	140 29.0	S60 44.5
Sabik	102 43.7	S15 41.7
Schedar	350 10.6	N56 25.2
Shaula	96 58.7	S37 05.2
Sirius	258 57.2	S16 41.1
Spica	158 59.9	S11 02.6
Suhail	223 12.2	S43 20.4
Vega	80 57.4	N38 46.1
Zuben'ubi	137 35.5	S15 56.8

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	158 48.4	10 33
Mars	234 00.0	5 31
Jupiter	263 31.8	3 33
Saturn	208 10.2	7 14

G.M.T.	SUN G.H.A.	SUN Dec.	MOON G.H.A.	v	MOON Dec.	d	H.P.
d h	° ′	° ′	° ′	′	° ′	′	′
3 00	184 06.0	S14 57.5	283 38.7	12.8	N15 39.3	5.2	54.6
01	199 06.0	58.3	298 10.5	12.8	15 34.1	5.3	54.6
02	214 06.0	59.0	312 42.3	12.8	15 28.8	5.3	54.6
03	229 06.0	14 59.8	327 14.1	12.9	15 23.5	5.3	54.6
04	244 06.0	15 00.6	341 46.0	12.8	15 18.2	5.5	54.7
05	259 06.0	01.4	356 17.8	12.8	15 12.7	5.5	54.7
06	274 06.0	S15 02.2	10 49.6	12.8	N15 07.2	5.6	54.7
07	289 06.0	03.0	25 21.4	12.9	15 01.6	5.7	54.7
T 08	304 06.0	03.7	39 53.3	12.8	14 55.9	5.8	54.7
H 09	319 06.0	· · 04.5	54 25.1	12.9	14 50.1	5.8	54.8
U 10	334 06.0	05.3	68 57.0	12.8	14 44.3	5.9	54.8
R 11	349 06.0	06.1	83 28.8	12.9	14 38.4	5.9	54.8
S 12	4 06.0	S15 06.9	98 00.7	12.9	N14 32.5	6.1	54.8
D 13	19 06.0	07.6	112 32.6	12.9	14 26.4	6.1	54.8
A 14	34 06.0	08.4	127 04.5	12.8	14 20.3	6.1	54.9
Y 15	49 06.0	· · 09.2	141 36.3	12.9	14 14.2	6.3	54.9
16	64 06.0	10.0	156 08.2	12.9	14 07.9	6.3	54.9
17	79 06.0	10.7	170 40.1	12.9	14 01.6	6.4	54.9
18	94 06.0	S15 11.5	185 12.0	12.9	N13 55.2	6.4	55.0
19	109 06.0	12.3	199 43.9	12.9	13 48.8	6.5	55.0
20	124 06.0	13.1	214 15.8	12.9	13 42.3	6.6	55.0
21	139 06.0	· · 13.9	228 47.7	12.9	13 35.7	6.7	55.0
22	154 06.0	14.6	243 19.6	12.9	13 29.0	6.7	55.0
23	169 06.0	15.4	257 51.5	12.9	13 22.3	6.8	55.1
4 00	184 06.0	S15 16.2	272 23.4	12.9	N13 15.5	6.8	55.1
01	199 06.0	17.0	286 55.3	12.9	13 08.7	6.9	55.1
02	214 06.0	17.7	301 27.2	13.0	13 01.8	7.0	55.1
03	229 06.0	· · 18.5	315 59.2	12.9	12 54.8	7.1	55.2
04	244 06.0	19.3	330 31.1	12.9	12 47.7	7.1	55.2
05	259 06.0	20.0	345 03.0	12.9	12 40.6	7.2	55.2
06	274 06.0	S15 20.8	359 34.9	12.9	N12 33.4	7.2	55.2
07	289 05.9	21.6	14 06.8	12.9	12 26.2	7.3	55.3
08	304 05.9	22.4	28 38.7	12.9	12 18.9	7.4	55.3
F 09	319 05.9	· · 23.1	43 10.6	12.9	12 11.5	7.4	55.3
R 10	334 05.9	23.9	57 42.5	13.0	12 04.1	7.5	55.4
I 11	349 05.9	24.7	72 14.5	12.9	11 56.6	7.6	55.4
D 12	4 05.9	S15 25.4	86 46.4	12.9	N11 49.0	7.6	55.4
A 13	19 05.9	26.2	101 18.3	12.9	11 41.4	7.7	55.4
Y 14	34 05.9	27.0	115 50.2	12.9	11 33.7	7.8	55.5
15	49 05.9	· · 27.7	130 22.1	12.9	11 25.9	7.8	55.5
16	64 05.9	28.5	144 54.0	12.9	11 18.1	7.8	55.5
17	79 05.8	29.3	159 25.9	12.8	11 10.3	8.0	55.5
18	94 05.8	S15 30.0	173 57.7	12.9	N11 02.3	7.9	55.6
19	109 05.8	30.8	188 29.6	12.9	10 54.4	8.1	55.6
20	124 05.8	31.6	203 01.5	12.9	10 46.3	8.1	55.6
21	139 05.8	· · 32.3	217 33.4	12.8	10 38.2	8.2	55.7
22	154 05.8	33.1	232 05.2	12.9	10 30.0	8.2	55.7
23	169 05.8	33.9	246 37.1	12.8	10 21.8	8.3	55.7
5 00	184 05.7	S15 34.6	261 08.9	12.9	N10 13.5	8.3	55.8
01	199 05.7	35.4	275 40.8	12.8	10 05.2	8.4	55.8
02	214 05.7	36.2	290 12.6	12.8	9 56.8	8.4	55.8
03	229 05.7	· · 36.9	304 44.4	12.9	9 48.4	8.5	55.9
04	244 05.7	37.7	319 16.3	12.8	9 39.9	8.6	55.9
05	259 05.7	38.4	333 48.1	12.8	9 31.3	8.6	55.9
06	274 05.7	S15 39.2	348 19.9	12.7	N 9 22.7	8.7	55.9
07	289 05.6	40.0	2 51.6	12.8	9 14.0	8.7	56.0
S 08	304 05.6	40.7	17 23.4	12.8	9 05.3	8.8	56.0
A 09	319 05.6	· · 41.5	31 55.2	12.7	8 56.5	8.8	56.0
T 10	334 05.6	42.2	46 26.9	12.8	8 47.7	8.9	56.1
U 11	349 05.6	43.0	60 58.7	12.7	8 38.8	8.9	56.1
R 12	4 05.5	S15 43.8	75 30.4	12.7	N 8 29.9	9.0	56.1
D 13	19 05.5	44.5	90 02.1	12.7	8 20.9	9.0	56.2
A 14	34 05.5	45.3	104 33.8	12.7	8 11.9	9.1	56.2
Y 15	49 05.5	· · 46.0	119 05.5	12.6	8 02.8	9.2	56.2
16	64 05.5	46.8	133 37.1	12.7	7 53.6	9.1	56.3
17	79 05.4	47.5	148 08.8	12.6	7 44.5	9.3	56.3
18	94 05.4	S15 48.3	162 40.4	12.6	N 7 35.2	9.3	56.3
19	109 05.4	49.1	177 12.0	12.6	7 25.9	9.3	56.4
20	124 05.4	49.8	191 43.6	12.6	7 16.6	9.4	56.4
21	139 05.4	· · 50.6	206 15.2	12.5	7 07.2	9.4	56.5
22	154 05.3	51.3	220 46.7	12.6	6 57.8	9.5	56.5
23	169 05.3	52.1	235 18.3	12.5	6 48.3	9.5	56.5
	S.D. 16.2	d 0.8	S.D. 14.9		15.1		15.3

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 3	Moonrise 4	Moonrise 5	Moonrise 6
°	h m	h m	h m	h m	h m	h m	h m
N 72	06 17	07 42	09 15	20 33	22 15	23 58	25 43
N 70	06 12	07 28	08 45	21 00	22 33	24 08	00 08
68	06 07	07 16	08 23	21 20	22 46	24 16	00 16
66	06 03	07 06	08 06	21 36	22 58	24 22	00 22
64	06 00	06 57	07 51	21 49	23 07	24 28	00 28
62	05 57	06 50	07 40	22 00	23 15	24 33	00 33
60	05 54	06 44	07 30	22 10	23 22	24 37	00 37
N 58	05 51	06 38	07 21	22 18	23 28	24 41	00 41
56	05 48	06 33	07 13	22 25	23 33	24 44	00 44
54	05 46	06 28	07 06	22 32	23 38	24 47	00 47
52	05 44	06 24	07 00	22 37	23 42	24 49	00 49
50	05 42	06 20	06 54	22 43	23 46	24 52	00 52
45	05 37	06 11	06 42	22 54	23 54	24 57	00 57
N 40	05 32	06 04	06 32	23 03	24 01	00 01	01 01
35	05 27	05 57	06 24	23 11	24 07	00 07	01 05
30	05 23	05 51	06 16	23 18	24 12	00 12	01 08
20	05 14	05 40	06 03	23 30	24 22	00 22	01 14
N 10	05 04	05 29	05 51	23 41	24 30	00 30	01 19
0	04 54	05 19	05 40	23 51	24 37	00 37	01 24
S 10	04 42	05 07	05 29	24 00	00 00	00 44	01 29
20	04 27	04 54	05 17	24 11	00 11	00 52	01 34
30	04 08	04 38	05 03	24 23	00 23	01 01	01 39
35	03 55	04 28	04 55	24 30	00 30	01 07	01 42
40	03 41	04 16	04 46	00 00	00 38	01 12	01 46
45	03 22	04 02	04 35	00 11	00 47	01 19	01 50
S 50	02 58	03 45	04 22	00 25	00 58	01 27	01 56
52	02 46	03 37	04 15	00 31	01 03	01 31	01 58
54	02 32	03 27	04 09	00 38	01 08	01 35	02 00
56	02 14	03 16	04 01	00 45	01 14	01 40	02 03
58	01 53	03 04	03 52	00 54	01 21	01 45	02 06
S 60	01 25	02 49	03 42	01 04	01 29	01 51	02 10

Lat.	Sunset	Twilight Civil	Twilight Naut.	Moonset 3	Moonset 4	Moonset 5	Moonset 6
°	h m	h m	h m	h m	h m	h m	h m
N 72	14 10	15 43	17 08	14 57	14 51	14 45	14 40
N 70	14 41	15 58	17 14	14 29	14 32	14 34	14 34
68	15 03	16 10	17 18	14 07	14 17	14 24	14 30
66	15 21	16 20	17 22	13 51	14 05	14 16	14 26
64	15 35	16 29	17 26	13 37	13 55	14 09	14 22
62	15 47	16 36	17 29	13 25	13 46	14 04	14 19
60	15 57	16 43	17 32	13 15	13 38	13 59	14 17
N 58	16 06	16 48	17 35	13 06	13 32	13 54	14 15
56	16 13	16 54	17 38	12 59	13 26	13 50	14 13
54	16 20	16 58	17 40	12 52	13 21	13 46	14 11
52	16 27	17 02	17 43	12 46	13 16	13 43	14 09
50	16 32	17 06	17 45	12 40	13 11	13 40	14 08
45	16 44	17 15	17 50	12 28	13 02	13 34	14 04
N 40	16 54	17 23	17 55	12 18	12 54	13 28	14 01
35	17 03	17 29	17 59	12 10	12 47	13 23	13 59
30	17 11	17 36	18 04	12 02	12 41	13 19	13 57
20	17 24	17 47	18 13	11 49	12 31	13 12	13 53
N 10	17 36	17 58	18 23	11 37	12 22	13 05	13 50
0	17 47	18 09	18 33	11 27	12 13	12 59	13 46
S 10	17 58	18 20	18 46	11 16	12 04	12 53	13 43
20	18 10	18 34	19 01	11 04	11 55	12 47	13 40
30	18 25	18 50	19 20	10 51	11 44	12 39	13 36
35	18 33	19 00	19 33	10 43	11 38	12 35	13 34
40	18 42	19 12	19 48	10 34	11 31	12 30	13 31
45	18 53	19 26	20 06	10 24	11 22	12 24	13 28
S 50	19 07	19 44	20 31	10 11	11 12	12 17	13 24
52	19 13	19 52	20 43	10 05	11 08	12 14	13 22
54	19 20	20 02	20 58	09 58	11 03	12 10	13 21
56	19 28	20 13	21 15	09 51	10 57	12 06	13 19
58	19 37	20 26	21 38	09 43	10 51	12 02	13 16
S 60	19 47	20 41	22 08	09 34	10 43	11 57	13 14

Day	SUN Eqn. of Time 00ʰ	SUN Eqn. of Time 12ʰ	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
	m s	m s	h m	h m	h m	d	
3	16 24	16 24	11 44	05 15	17 39	22	◐
4	16 24	16 24	11 44	06 02	18 25	23	
5	16 23	16 22	11 44	06 48	19 12	24	

1977 NOVEMBER 6, 7, 8 (SUN., MON., TUES.)

	G.M.T.	ARIES	VENUS −3.4		MARS +0.3		JUPITER −2.2		SATURN +0.8	
		G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
	d h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
	6 00	45 05.7	201 34.0	S 8 12.1	278 18.3	N20 47.9	308 42.6	N22 58.1	253 08.4	N12 49.0
	01	60 08.2	216 33.5	13.2	293 19.8	47.8	323 45.2	58.1	268 10.7	49.0
	02	75 10.7	231 33.1	14.4	308 21.3	47.7	338 47.7	58.1	283 13.0	48.9
	03	90 13.1	246 32.6	·· 15.6	323 22.8	·· 47.5	353 50.3	·· 58.1	298 15.3	·· 48.9
	04	105 15.6	261 32.2	16.7	338 24.3	47.4	8 52.9	58.1	313 17.7	48.8
	05	120 18.1	276 31.7	17.9	353 25.8	47.3	23 55.5	58.1	328 20.0	48.8
	06	135 20.5	291 31.2	S 8 19.1	8 27.3	N20 47.1	38 58.0	N22 58.1	343 22.3	N12 48.8
	07	150 23.0	306 30.8	20.2	23 28.8	47.0	54 00.6	58.1	358 24.6	48.7
	08	165 25.5	321 30.3	21.4	38 30.3	46.8	69 03.2	58.1	13 26.9	48.7
S	09	180 27.9	336 29.8	·· 22.5	53 31.8	·· 46.7	84 05.8	·· 58.1	28 29.2	·· 48.6
U	10	195 30.4	351 29.4	23.7	68 33.3	46.6	99 08.4	58.1	43 31.5	48.6
N	11	210 32.8	6 28.9	24.9	83 34.8	46.4	114 11.0	58.1	58 33.8	48.5
D	12	225 35.3	21 28.4	S 8 26.0	98 36.3	N20 46.3	129 13.5	N22 58.2	73 36.2	N12 48.5
A	13	240 37.8	36 28.0	27.2	113 37.8	46.1	144 16.1	58.2	88 38.5	48.4
Y	14	255 40.2	51 27.5	28.4	128 39.3	46.0	159 18.7	58.2	103 40.8	48.4
	15	270 42.7	66 27.0	·· 29.5	143 40.8	·· 45.9	174 21.3	·· 58.2	118 43.1	·· 48.3
	16	285 45.2	81 26.6	30.7	158 42.3	45.7	189 23.9	58.2	133 45.4	48.3
	17	300 47.6	96 26.1	31.9	173 43.8	45.6	204 26.4	58.2	148 47.7	48.2
	18	315 50.1	111 25.6	S 8 33.0	188 45.3	N20 45.5	219 29.0	N22 58.2	163 50.0	N12 48.2
	19	330 52.6	126 25.2	34.2	203 46.8	45.3	234 31.6	58.2	178 52.3	48.2
	20	345 55.0	141 24.7	35.3	218 48.3	45.2	249 34.2	58.2	193 54.7	48.1
	21	0 57.5	156 24.2	·· 36.5	233 49.8	·· 45.0	264 36.8	·· 58.2	208 57.0	·· 48.1
	22	16 00.0	171 23.8	37.7	248 51.3	44.9	279 39.4	58.2	223 59.3	48.0
	23	31 02.4	186 23.3	38.8	263 52.8	44.8	294 42.0	58.2	239 01.6	48.0
	7 00	46 04.9	201 22.8	S 8 40.0	278 54.4	N20 44.6	309 44.5	N22 58.2	254 03.9	N12 47.9
	01	61 07.3	216 22.3	41.1	293 55.9	44.5	324 47.1	58.3	269 06.2	47.9
	02	76 09.8	231 21.9	42.3	308 57.4	44.4	339 49.7	58.3	284 08.6	47.8
	03	91 12.3	246 21.4	·· 43.5	323 58.9	·· 44.2	354 52.3	·· 58.3	299 10.9	·· 47.8
	04	106 14.7	261 20.9	44.6	339 00.4	44.1	9 54.9	58.3	314 13.2	47.7
	05	121 17.2	276 20.5	45.8	354 01.9	44.0	24 57.5	58.3	329 15.5	47.7
	06	136 19.7	291 20.0	S 8 46.9	9 03.4	N20 43.8	40 00.1	N22 58.3	344 17.8	N12 47.7
	07	151 22.1	306 19.5	48.1	24 05.0	43.7	55 02.7	58.3	359 20.1	47.6
	08	166 24.6	321 19.0	49.2	39 06.5	43.5	70 05.2	58.3	14 22.4	47.6
M	09	181 27.1	336 18.6	·· 50.4	54 08.0	·· 43.4	85 07.8	·· 58.3	29 24.8	·· 47.5
O	10	196 29.5	351 18.1	51.6	69 09.5	43.3	100 10.4	58.3	44 27.1	47.5
N	11	211 32.0	6 17.6	52.7	84 11.0	43.1	115 13.0	58.3	59 29.4	47.4
D	12	226 34.4	21 17.1	S 8 53.9	99 12.6	N20 43.0	130 15.6	N22 58.3	74 31.7	N12 47.4
A	13	241 36.9	36 16.7	55.0	114 14.1	42.9	145 18.2	58.4	89 34.0	47.3
Y	14	256 39.4	51 16.2	56.2	129 15.6	42.7	160 20.8	58.4	104 36.3	47.3
	15	271 41.8	66 15.7	·· 57.3	144 17.1	·· 42.6	175 23.4	·· 58.4	119 38.7	·· 47.2
	16	286 44.3	81 15.2	58.5	159 18.7	42.5	190 26.0	58.4	134 41.0	47.2
	17	301 46.8	96 14.8	8 59.7	174 20.2	42.3	205 28.6	58.4	149 43.3	47.2
	18	316 49.2	111 14.3	S 9 00.8	189 21.7	N20 42.2	220 31.2	N22 58.4	164 45.6	N12 47.1
	19	331 51.7	126 13.8	02.0	204 23.2	42.1	235 33.8	58.4	179 47.9	47.1
	20	346 54.2	141 13.3	03.1	219 24.8	41.9	250 36.4	58.4	194 50.3	47.0
	21	1 56.6	156 12.9	·· 04.3	234 26.3	·· 41.8	265 38.9	·· 58.4	209 52.6	·· 47.0
	22	16 59.1	171 12.4	05.4	249 27.8	41.7	280 41.5	58.4	224 54.9	46.9
	23	32 01.6	186 11.9	06.6	264 29.4	41.5	295 44.1	58.4	239 57.2	46.9
	8 00	47 04.0	201 11.4	S 9 07.7	279 30.9	N20 41.4	310 46.7	N22 58.4	254 59.5	N12 46.9
	01	62 06.5	216 11.0	08.9	294 32.4	41.3	325 49.3	58.5	270 01.8	46.8
	02	77 08.9	231 10.5	10.0	309 33.9	41.1	340 51.9	58.5	285 04.2	46.8
	03	92 11.4	246 10.0	·· 11.2	324 35.5	·· 41.0	355 54.5	·· 58.5	300 06.5	·· 46.7
	04	107 13.9	261 09.5	12.3	339 37.0	40.9	10 57.1	58.5	315 08.8	46.7
	05	122 16.3	276 09.0	13.5	354 38.5	40.7	25 59.7	58.5	330 11.1	46.6
	06	137 18.8	291 08.6	S 9 14.6	9 40.1	N20 40 6	41 02.3	N22 58.5	345 13.4	N12 46.6
	07	152 21.3	306 08.1	15.8	24 41.6	40.5	56 04.9	58.5	0 15.8	46.5
T	08	167 23.7	321 07.6	16.9	39 43.2	40.3	71 07.5	58.5	15 18.1	46.5
U	09	182 26.2	336 07.1	·· 18.1	54 44.7	·· 40.2	86 10.1	·· 58.5	30 20.4	·· 46.5
E	10	197 28.7	351 06.6	19.2	69 46.2	40.1	101 12.7	58.5	45 22.7	46.4
S	11	212 31.1	6 06.1	20.4	84 47.8	39.9	116 15.3	58.5	60 25.0	46.4
D	12	227 33.6	21 05.7	S 9 21.5	99 49.3	N20 39.8	131 17.9	N22 58.6	75 27.4	N12 46.3
A	13	242 36.1	36 05.2	22.7	114 50.9	39.7	146 20.5	58.6	90 29.7	46.3
Y	14	257 38.5	51 04.7	23.8	129 52.4	39.5	161 23.1	58.6	105 32.0	46.2
	15	272 41.0	66 04.2	·· 25.0	144 53.9	·· 39.4	176 25.7	·· 58.6	120 34.3	·· 46.2
	16	287 43.4	81 03.7	26.1	159 55.5	39.3	191 28.3	58.6	135 36.6	46.2
	17	302 45.9	96 03.2	27.3	174 57.0	39.1	206 30.9	58.6	150 39.0	46.1
	18	317 48.4	111 02.8	S 9 28.4	189 58.6	N20 39.0	221 33.5	N22 58.6	165 41.3	N12 46.1
	19	332 50.8	126 02.3	29.5	205 00.1	38.9	236 36.1	58.6	180 43.6	46.0
	20	347 53.3	141 01.8	30.7	220 01.7	38.8	251 38.7	58.6	195 45.9	46.0
	21	2 55.8	156 01.3	·· 31.8	235 03.2	·· 38.6	266 41.3	·· 58.6	210 48.3	·· 45.9
	22	17 58.2	171 00.8	33.0	250 04.8	38.5	281 43.9	58.6	225 50.6	45.9
	23	33 00.7	186 00.3	34.1	265 06.3	38.4	296 46.5	58.6	240 52.9	45.9
	Mer. Pass.	h m 20 52.2	v −0.5	d 1.2	v 1.5	d 0.1	v 2.6	d 0.0	v 2.3	d 0.0

STARS

Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 38.3	S40 23.6
Achernar	335 46.3	S57 21.0
Acrux	173 39.8	S62 58.4
Adhara	255 33.4	S28 56.4
Aldebaran	291 19.9	N16 27.9
Alioth	166 44.8	N56 04.7
Alkaid	153 20.6	N49 25.4
Al Na'ir	28 17.3	S47 04.2
Alnilam	276 13.4	S 1 12.9
Alphard	218 22.5	S 8 33.7
Alphecca	126 34.1	N26 47.5
Alpheratz	358 11.0	N28 58.3
Altair	62 34.5	N 8 48.8
Ankaa	353 41.9	S42 25.6
Antares	112 59.6	S26 22.9
Arcturus	146 20.6	N19 18.0
Atria	108 26.0	S68 59.3
Avior	234 28.8	S59 26.1
Bellatrix	279 00.6	N 6 19.8
Betelgeuse	271 30.1	N 7 24.2
Canopus	264 07.7	S52 40.9
Capella	281 13.8	N45 58.4
Deneb	49 49.8	N45 12.5
Denebola	183 01.3	N14 41.8
Diphda	349 22.6	S18 06.5
Dubhe	194 25.0	N61 52.0
Elnath	278 46.3	N28 35.3
Eltanin	90 59.0	N51 29.8
Enif	34 13.4	N 9 46.6
Fomalhaut	15 53.4	S29 44.4
Gacrux	172 31.3	S56 59.1
Gienah	176 20.2	S17 25.0
Hadar	149 26.6	S60 15.8
Hamal	328 30.8	N23 21.6
Kaus Aust.	84 19.7	S34 23.7
Kochab	137 20.3	N74 14.8
Markab	14 04.9	N15 05.4
Menkar	314 42.8	N 4 00.2
Menkent	148 39.7	S36 15.5
Miaplacidus	221 45.2	S69 37.3
Mirfak	309 18.3	N49 47.0
Nunki	76 31.8	S26 19.4
Peacock	54 01.6	S56 48.5
Pollux	244 00.4	N28 04.6
Procyon	245 27.7	N 5 16.9
Rasalhague	96 31.7	N12 34.8
Regulus	208 12.2	N12 04.5
Rigel	281 37.6	S 8 13.6
Rigil Kent.	140 29.0	S60 44.4
Sabik	102 43.7	S15 41.7
Schedar	350 10.7	N56 25.2
Shaula	96 58.7	S37 05.2
Sirius	258 57.2	S16 41.1
Spica	158 59.9	S11 02.6
Suhail	223 12.2	S43 20.4
Vega	80 57.4	N38 46.1
Zuben'ubi	137 35.5	S15 56.8

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	155 17.9	10 35
Mars	232 49.5	5 24
Jupiter	263 39.7	3 20
Saturn	207 59.0	7 03

G.M.T.	SUN		MOON				
	G.H.A.	Dec.	G.H.A.	v	Dec.	d	H.P.
d h	° ′	° ′	° ′	′	° ′	′	′
6 00	184 05.3	S15 52.8	249 49.8	12.5	N 6 38.8	9.5	56.6
01	199 05.3	53.6	264 21.3	12.5	6 29.3	9.6	56.6
02	214 05.2	54.3	278 52.8	12.4	6 19.7	9.7	56.6
03	229 05.2	·· 55.1	293 24.2	12.4	6 10.0	9.7	56.7
04	244 05.2	55.8	307 55.6	12.4	6 00.3	9.7	56.7
05	259 05.2	56.6	322 27.0	12.4	5 50.6	9.8	56.7
06	274 05.1	S15 57.3	336 58.4	12.4	N 5 40.8	9.8	56.8
07	289 05.1	58.1	351 29.8	12.3	5 31.0	9.8	56.8
08	304 05.1	58.8	6 01.1	12.3	5 21.2	9.9	56.9
S 09	319 05.1	15 59.6	20 32.4	12.3	5 11.3	10.0	56.9
U 10	334 05.0	16 00.3	35 03.7	12.2	5 01.3	9.9	56.9
N 11	349 05.0	01.1	49 34.9	12.3	4 51.4	10.1	57.0
D 12	4 05.0	S16 01.8	64 06.2	12.2	N 4 41.3	10.0	57.0
A 13	19 05.0	02.6	78 37.4	12.1	4 31.3	10.1	57.0
Y 14	34 04.9	03.3	93 08.5	12.2	4 21.2	10.1	57.1
15	49 04.9	·· 04.1	107 39.7	12.1	4 11.1	10.2	57.1
16	64 04.9	04.8	122 10.8	12.0	4 00.9	10.2	57.2
17	79 04.8	05.6	136 41.8	12.1	3 50.7	10.2	57.2
18	94 04.8	S16 06.3	151 12.9	12.0	N 3 40.5	10.2	57.2
19	109 04.8	07.0	165 43.9	12.0	3 30.3	10.3	57.3
20	124 04.7	07.8	180 14.9	11.9	3 20.0	10.3	57.3
21	139 04.7	·· 08.5	194 45.8	11.9	3 09.7	10.4	57.3
22	154 04.7	09.3	209 16.7	11.9	2 59.3	10.4	57.4
23	169 04.7	10.0	223 47.6	11.8	2 48.9	10.4	57.4
7 00	184 04.6	S16 10.8	238 18.4	11.9	N 2 38.5	10.4	57.5
01	199 04.6	11.5	252 49.3	11.7	2 28.1	10.5	57.5
02	214 04.6	12.2	267 20.0	11.7	2 17.6	10.5	57.5
03	229 04.5	·· 13.0	281 50.7	11.7	2 07.1	10.5	57.6
04	244 04.5	13.7	296 21.4	11.7	1 56.6	10.5	57.6
05	259 04.5	14.5	310 52.1	11.6	1 46.1	10.6	57.7
06	274 04.4	S16 15.2	325 22.7	11.6	N 1 35.5	10.6	57.7
07	289 04.4	15.9	339 53.3	11.5	1 24.9	10.6	57.7
08	304 04.3	16.7	354 23.8	11.5	1 14.3	10.7	57.8
M 09	319 04.3	·· 17.4	8 54.3	11.4	1 03.6	10.6	57.8
O 10	334 04.3	18.2	23 24.7	11.4	0 53.0	10.7	57.9
N 11	349 04.2	18.9	37 55.1	11.4	0 42.3	10.7	57.9
D 12	4 04.2	S16 19.6	52 25.5	11.3	N 0 31.6	10.7	57.9
A 13	19 04.2	20.4	66 55.8	11.3	0 20.9	10.7	58.0
Y 14	34 04.1	21.1	81 26.1	11.2	N 0 10.2	10.8	58.0
15	49 04.1	·· 21.8	95 56.3	11.2	S 0 00.6	10.8	58.1
16	64 04.1	22.6	110 26.5	11.1	0 11.4	10.7	58.1
17	79 04.0	23.3	124 56.6	11.1	0 22.1	10.8	58.1
18	94 04.0	S16 24.0	139 26.7	11.0	S 0 32.9	10.8	58.2
19	109 03.9	24.8	153 56.7	11.0	0 43.7	10.8	58.2
20	124 03.9	25.5	168 26.7	10.9	0 54.5	10.9	58.3
21	139 03.9	·· 26.2	182 56.6	10.9	1 05.4	10.8	58.3
22	154 03.8	27.0	197 26.5	10.8	1 16.2	10.9	58.3
23	169 03.8	27.7	211 56.3	10.8	1 27.1	10.8	58.4
8 00	184 03.7	S16 28.4	226 26.1	10.7	S 1 37.9	10.9	58.4
01	199 03.7	29.2	240 55.8	10.7	1 48.8	10.8	58.4
02	214 03.7	29.9	255 25.5	10.6	1 59.6	10.9	58.5
03	229 03.6	·· 30.6	269 55.1	10.6	2 10.5	10.9	58.5
04	244 03.6	31.3	284 24.7	10.5	2 21.4	10.9	58.6
05	259 03.5	32.1	298 54.2	10.5	2 32.3	10.9	58.6
06	274 03.5	S16 32.8	313 23.7	10.4	S 2 43.2	10.8	58.6
07	289 03.4	33.5	327 53.1	10.3	2 54.0	10.9	58.7
T 08	304 03.4	34.2	342 22.4	10.3	3 04.9	10.9	58.7
U 09	319 03.3	·· 35.0	356 51.7	10.2	3 15.8	10.9	58.8
E 10	334 03.3	35.7	11 20.9	10.2	3 26.7	10.8	58.8
S 11	349 03.3	36.4	25 50.1	10.1	3 37.5	10.9	58.8
D 12	4 03.2	S16 37.1	40 19.2	10.1	S 3 48.4	10.9	58.9
A 13	19 03.2	37.9	54 48.3	10.0	3 59.3	10.8	58.9
Y 14	34 03.1	38.6	69 17.3	9.9	4 10.1	10.9	58.9
15	49 03.1	·· 39.3	83 46.2	9.8	4 21.0	10.8	59.0
16	64 03.0	40.0	98 15.0	9.9	4 31.8	10.8	59.0
17	79 03.0	40.8	112 43.9	9.7	4 42.6	10.8	59.1
18	94 02.9	S16 41.5	127 12.6	9.7	S 4 53.4	10.8	59.1
19	109 02.9	42.2	141 41.3	9.6	5 04.2	10.8	59.1
20	124 02.8	42.9	156 09.9	9.5	5 15.0	10.8	59.2
21	139 02.8	·· 43.6	170 38.4	9.5	5 25.8	10.7	59.2
22	154 02.7	44.4	185 06.9	9.5	5 36.5	10.7	59.2
23	169 02.7	45.1	199 35.4	9.3	5 47.2	10.8	59.3
	S.D. 16.2	d 0.7	S.D. 15.5		15.8		16.0

Lat.	Twilight		Sunrise	Moonrise			
	Naut.	Civil		6	7	8	9
°	h m	h m	h m	h m	h m	h m	h m
N 72	06 29	07 56	09 37	25 43	01 43	03 31	05 25
N 70	06 22	07 39	09 01	00 08	01 46	03 28	05 14
68	06 17	07 26	08 36	00 16	01 49	03 25	05 06
66	06 12	07 15	08 17	00 22	01 51	03 23	04 59
64	06 08	07 06	08 01	00 28	01 53	03 21	04 52
62	06 04	06 58	07 48	00 33	01 54	03 19	04 47
60	06 00	06 51	07 37	00 37	01 56	03 18	04 43
N 58	05 57	06 44	07 28	00 41	01 57	03 16	04 39
56	05 54	06 39	07 19	00 44	01 58	03 15	04 35
54	05 51	06 34	07 12	00 47	01 59	03 14	04 32
52	05 49	06 29	07 05	00 49	02 00	03 13	04 29
50	05 46	06 25	06 59	00 52	02 01	03 12	04 27
45	05 40	06 15	06 46	00 57	02 02	03 10	04 21
N 40	05 35	06 07	06 36	01 01	02 04	03 09	04 16
35	05 30	06 00	06 27	01 05	02 05	03 07	04 12
30	05 25	05 53	06 18	01 08	02 06	03 06	04 09
20	05 15	05 41	06 04	01 14	02 08	03 04	04 03
N 10	05 05	05 30	05 52	01 19	02 10	03 03	03 58
0	04 54	05 19	05 40	01 24	02 12	03 01	03 53
S 10	04 41	05 06	05 28	01 29	02 13	02 59	03 48
20	04 25	04 52	05 16	01 34	02 15	02 58	03 43
30	04 05	04 35	05 01	01 39	02 17	02 56	03 37
35	03 52	04 25	04 52	01 42	02 18	02 55	03 33
40	03 37	04 13	04 42	01 46	02 19	02 54	03 30
45	03 17	03 58	04 31	01 50	02 21	02 52	03 25
S 50	02 51	03 39	04 17	01 56	02 23	02 51	03 20
52	02 38	03 30	04 10	01 58	02 24	02 50	03 18
54	02 23	03 20	04 03	02 00	02 25	02 49	03 15
56	02 04	03 09	03 55	02 03	02 26	02 48	03 13
58	01 40	02 55	03 45	02 06	02 27	02 47	03 09
S 60	01 06	02 39	03 35	02 10	02 28	02 46	03 06

Lat.	Sunset	Twilight		Moonset			
		Civil	Naut.	6	7	8	9
°	h m	h m	h m	h m	h m	h m	h m
N 72	13 49	15 30	16 57	14 40	14 34	14 29	14 23
N 70	14 25	15 47	17 04	14 34	14 35	14 35	14 36
68	14 50	16 00	17 09	14 30	14 35	14 40	14 46
66	15 10	16 11	17 14	14 26	14 35	14 44	14 55
64	15 25	16 21	17 19	14 22	14 35	14 48	15 02
62	15 38	16 29	17 23	14 19	14 35	14 51	15 09
60	15 49	16 36	17 26	14 17	14 35	14 53	15 14
N 58	15 59	16 42	17 30	14 15	14 35	14 56	15 19
56	16 07	16 48	17 33	14 13	14 35	14 58	15 23
54	16 15	16 53	17 35	14 11	14 35	15 00	15 27
52	16 21	16 58	17 38	14 09	14 35	15 02	15 31
50	16 27	17 02	17 41	14 08	14 35	15 03	15 34
45	16 40	17 12	17 47	14 04	14 35	15 07	15 41
N 40	16 51	17 20	17 52	14 01	14 35	15 10	15 47
35	17 01	17 27	17 57	13 59	14 35	15 12	15 52
30	17 09	17 34	18 02	13 57	14 35	15 15	15 57
20	17 23	17 46	18 12	13 53	14 35	15 18	16 05
N 10	17 35	17 57	18 22	13 50	14 35	15 22	16 12
0	17 47	18 09	18 34	13 46	14 35	15 25	16 18
S 10	17 59	18 21	18 47	13 43	14 35	15 28	16 25
20	18 12	18 35	19 03	13 40	14 35	15 32	16 32
30	18 27	18 53	19 23	13 36	14 35	15 36	16 39
35	18 36	19 03	19 36	13 34	14 35	15 38	16 44
40	18 46	19 15	19 52	13 31	14 34	15 41	16 49
45	18 57	19 30	20 12	13 28	14 34	15 44	16 55
S 50	19 12	19 49	20 38	13 24	14 34	15 47	17 03
52	19 18	19 58	20 51	13 22	14 34	15 49	17 06
54	19 26	20 09	21 07	13 21	14 34	15 51	17 10
56	19 34	20 21	21 26	13 19	14 34	15 53	17 14
58	19 44	20 34	21 51	13 16	14 34	15 55	17 18
S 60	19 55	20 51	22 27	13 14	14 34	15 57	17 23

Day	SUN			MOON			
	Eqn. of Time 00ʰ	Eqn. of Time 12ʰ	Mer. Pass.	Mer. Pass. Upper	Mer. Pass. Lower	Age	Phase
	m s	m s	h m	h m	h m	d	
6	16 21	16 20	11 44	07 35	19 59	25	
7	16 19	16 17	11 44	08 23	20 48	26	◐
8	16 15	16 13	11 44	09 13	21 39	27	

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	G.M.T.	ARIES	VENUS −3.4		MARS +0.3		JUPITER −2.2		SATURN +0.8	
		G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
	d h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
	9 00	48 03.2	200 59.9	S 9 35.3	280 07.9	N20 38.2	311 49.1	N22 58.7	255 55.2	N12 45.8
	01	63 05.6	215 59.4	36.4	295 09.4	38.1	326 51.7	58.7	270 57.5	45.8
	02	78 08.1	230 58.9	37.6	310 11.0	38.0	341 54.3	58.7	285 59.9	45.7
	03	93 10.5	245 58.4	·· 38.7	325 12.5	·· 37.8	356 56.9	·· 58.7	301 02.2	·· 45.7
	04	108 13.0	260 57.9	39.8	340 14.1	37.7	11 59.5	58.7	316 04.5	45.6
	05	123 15.5	275 57.4	41.0	355 15.6	37.6	27 02.1	58.7	331 06.8	45.6
	06	138 17.9	290 56.9	S 9 42.1	10 17.2	N20 37.5	42 04.8	N22 58.7	346 09.2	N12 45.6
W	07	153 20.4	305 56.4	43.3	25 18.7	37.3	57 07.4	58.7	1 11.5	45.5
E	08	168 22.9	320 55.9	44.4	40 20.3	37.2	72 10.0	58.7	16 13.8	45.5
D	09	183 25.3	335 55.5	·· 45.5	55 21.8	·· 37.1	87 12.6	·· 58.7	31 16.1	·· 45.4
N	10	198 27.8	350 55.0	46.7	70 23.4	36.9	102 15.2	58.7	46 18.5	45.4
E	11	213 30.3	5 54.5	47.8	85 25.0	36.8	117 17.8	58.8	61 20.8	45.3
S	12	228 32.7	20 54.0	S 9 49.0	100 26.5	N20 36.7	132 20.4	N22 58.8	76 23.1	N12 45.3
D	13	243 35.2	35 53.5	50.1	115 28.1	36.6	147 23.0	58.8	91 25.4	45.3
A	14	258 37.7	50 53.0	51.2	130 29.6	36.4	162 25.6	58.8	106 27.7	45.2
Y	15	273 40.1	65 52.5	·· 52.4	145 31.2	·· 36.3	177 28.2	·· 58.8	121 30.1	·· 45.2
	16	288 42.6	80 52.0	53.5	160 32.8	36.2	192 30.8	58.8	136 32.4	45.1
	17	303 45.0	95 51.5	54.6	175 34.3	36.0	207 33.4	58.8	151 34.7	45.1
	18	318 47.5	110 51.0	S 9 55.8	190 35.9	N20 35.9	222 36.1	N22 58.8	166 37.0	N12 45.1
	19	333 50.0	125 50.5	56.9	205 37.4	35.8	237 38.7	58.8	181 39.4	45.0
	20	348 52.4	140 50.0	58.1	220 39.0	35.7	252 41.3	58.8	196 41.7	45.0
	21	3 54.9	155 49.5	9 59.2	235 40.6	·· 35.5	267 43.9	·· 58.8	211 44.0	·· 44.9
	22	18 57.4	170 49.1	10 00.3	250 42.1	35.4	282 46.5	58.9	226 46.4	44.9
	23	33 59.8	185 48.6	01.5	265 43.7	35.3	297 49.1	58.9	241 48.7	44.8
	10 00	49 02.3	200 48.1	S10 02.6	280 45.3	N20 35.2	312 51.7	N22 58.9	256 51.0	N12 44.8
	01	64 04.8	215 47.6	03.7	295 46.9	35.0	327 54.3	58.9	271 53.3	44.8
	02	79 07.2	230 47.1	04.9	310 48.4	34.9	342 57.0	58.9	286 55.7	44.7
	03	94 09.7	245 46.6	·· 06.0	325 50.0	·· 34.8	357 59.6	·· 58.9	301 58.0	·· 44.7
	04	109 12.2	260 46.1	07.1	340 51.6	34.7	13 02.2	58.9	317 00.3	44.6
	05	124 14.6	275 45.6	08.3	355 53.1	34.5	28 04.8	58.9	332 02.6	44.6
	06	139 17.1	290 45.1	S10 09.4	10 54.7	N20 34.4	43 07.4	N22 58.9	347 05.0	N12 44.6
	07	154 19.5	305 44.6	10.5	25 56.3	34.3	58 10.0	58.9	2 07.3	44.5
T	08	169 22.0	320 44.1	11.7	40 57.9	34.2	73 12.6	58.9	17 09.6	44.5
H	09	184 24.5	335 43.6	·· 12.8	55 59.4	·· 34.0	88 15.3	·· 59.0	32 11.9	·· 44.4
U	10	199 26.9	350 43.1	13.9	71 01.0	33.9	103 17.9	59.0	47 14.3	44.4
R	11	214 29.4	5 42.6	15.1	86 02.6	33.8	118 20.5	59.0	62 16.6	44.4
S	12	229 31.9	20 42.1	S10 16.2	101 04.2	N20 33.7	133 23.1	N22 59.0	77 18.9	N12 44.3
D	13	244 34.3	35 41.6	17.3	116 05.8	33.5	148 25.7	59.0	92 21.3	44.3
A	14	259 36.8	50 41.1	18.4	131 07.3	33.4	163 28.3	59.0	107 23.6	44.2
Y	15	274 39.3	65 40.6	·· 19.6	146 08.9	·· 33.3	178 31.0	·· 59.0	122 25.9	·· 44.2
	16	289 41.7	80 40.1	20.7	161 10.5	33.2	193 33.6	59.0	137 28.2	44.2
	17	304 44.2	95 39.6	21.8	176 12.1	33.0	208 36.2	59.0	152 30.6	44.1
	18	319 46.6	110 39.1	S10 23.0	191 13.7	N20 32.9	223 38.8	N22 59.0	167 32.9	N12 44.1
	19	334 49.1	125 38.6	24.1	206 15.2	32.8	238 41.4	59.1	182 35.2	44.0
	20	349 51.6	140 38.1	25.2	221 16.8	32.7	253 44.1	59.1	197 37.6	44.0
	21	4 54.0	155 37.6	·· 26.3	236 18.4	·· 32.5	268 46.7	·· 59.1	212 39.9	·· 44.0
	22	19 56.5	170 37.1	27.5	251 20.0	32.4	283 49.3	59.1	227 42.2	43.9
	23	34 59.0	185 36.6	28.6	266 21.6	32.3	298 51.9	59.1	242 44.6	43.9
	11 00	50 01.4	200 36.1	S10 29.7	281 23.2	N20 32.2	313 54.5	N22 59.1	257 46.9	N12 43.8
	01	65 03.9	215 35.6	30.8	296 24.8	32.0	328 57.2	59.1	272 49.2	43.8
	02	80 06.4	230 35.1	32.0	311 26.4	31.9	343 59.8	59.1	287 51.5	43.8
	03	95 08.8	245 34.5	·· 33.1	326 28.0	·· 31.8	359 02.4	·· 59.1	302 53.9	·· 43.7
	04	110 11.3	260 34.0	34.2	341 29.5	31.7	14 05.0	59.1	317 56.2	43.7
	05	125 13.8	275 33.5	35.3	356 31.1	31.6	29 07.6	59.1	332 58.5	43.6
	06	140 16.2	290 33.0	S10 36.4	11 32.7	N20 31.4	44 10.3	N22 59.2	348 00.9	N12 43.6
	07	155 18.7	305 32.5	37.6	26 34.3	31.3	59 12.9	59.2	3 03.2	43.6
	08	170 21.1	320 32.0	38.7	41 35.9	31.2	74 15.5	59.2	18 05.5	43.5
F	09	185 23.6	335 31.5	·· 39.8	56 37.5	·· 31.1	89 18.1	·· 59.2	33 07.9	·· 43.5
R	10	200 26.1	350 31.0	40.9	71 39.1	31.0	104 20.8	59.2	48 10.2	43.4
I	11	215 28.5	5 30.5	42.1	86 40.7	30.8	119 23.4	59.2	63 12.5	43.4
D	12	230 31.0	20 30.0	S10 43.2	101 42.3	N20 30.7	134 26.0	N22 59.2	78 14.9	N12 43.4
A	13	245 33.5	35 29.5	44.3	116 43.9	30.6	149 28.6	59.2	93 17.2	43.3
Y	14	260 35.9	50 29.0	45.4	131 45.5	30.5	164 31.3	59.2	108 19.5	43.3
	15	275 38.4	65 28.5	·· 46.5	146 47.1	·· 30.4	179 33.9	·· 59.2	123 21.9	·· 43.2
	16	290 40.9	80 27.9	47.7	161 48.7	30.2	194 36.5	59.3	138 24.2	43.2
	17	305 43.3	95 27.4	48.8	176 50.3	30.1	209 39.2	59.3	153 26.5	43.2
	18	320 45.8	110 26.9	S10 49.9	191 51.9	N20 30.0	224 41.8	N22 59.3	168 28.9	N12 43.1
	19	335 48.3	125 26.4	51.0	206 53.5	29.9	239 44.4	59.3	183 31.2	43.1
	20	350 50.7	140 25.9	52.1	221 55.1	29.8	254 47.0	59.3	198 33.5	43.0
	21	5 53.2	155 25.4	·· 53.2	236 56.7	·· 29.6	269 49.7	·· 59.3	213 35.9	·· 43.0
	22	20 55.6	170 24.9	54.4	251 58.3	29.5	284 52.3	59.3	228 38.2	43.0
	23	35 58.1	185 24.4	55.5	266 59.9	29.4	299 54.9	59.3	243 40.5	42.9
	Mer. Pass.	h m 20 40.5	v −0.5	d 1.1	v 1.6	d 0.1	v 2.6	d 0.0	v 2.3	d 0.0

STARS

Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 38.3	S40 23.6
Achernar	335 46.3	S57 21.1
Acrux	173 39.8	S62 58.3
Adhara	255 33.4	S28 56.4
Aldebaran	291 19.9	N16 27.9
Alioth	166 44.8	N56 04.7
Alkaid	153 20.6	N49 25.4
Al Na'ir	28 17.3	S47 04.2
Alnilam	276 13.4	S 1 13.0
Alphard	218 22.5	S 8 33.7
Alphecca	126 34.2	N26 47.5
Alpheratz	358 11.0	N28 58.3
Altair	62 34.6	N 8 48.8
Ankaa	353 41.9	S42 25.7
Antares	112 59.6	S26 22.9
Arcturus	146 20.6	N19 18.0
Atria	108 26.0	S68 59.3
Avior	234 28.8	S59 26.1
Bellatrix	279 00.5	N 6 19.8
Betelgeuse	271 30.1	N 7 24.2
Canopus	264 07.7	S52 40.9
Capella	281 13.7	N45 58.4
Deneb	49 49.8	N45 12.5
Denebola	183 01.2	N14 41.7
Diphda	349 22.6	S18 06.5
Dubhe	194 24.9	N61 52.0
Elnath	278 46.3	N28 35.3
Eltanin	90 59.1	N51 29.8
Enif	34 13.5	N 9 46.6
Fomalhaut	15 53.4	S29 44.4
Gacrux	172 31.2	S56 59.1
Gienah	176 20.2	S17 25.0
Hadar	149 26.6	S60 15.8
Hamal	328 30.8	N23 21.6
Kaus Aust.	84 19.7	S34 23.7
Kochab	137 20.3	N74 14.8
Markab	14 04.9	N15 05.4
Menkar	314 42.8	N 4 00.2
Menkent	148 39.6	S36 15.5
Miaplacidus	221 45.2	S69 37.3
Mirfak	309 18.3	N49 47.0
Nunki	76 31.8	S26 19.4
Peacock	54 01.7	S56 48.5
Pollux	244 00.4	N28 04.6
Procyon	245 27.7	N 5 16.9
Rasalhague	96 31.7	N12 34.8
Regulus	208 12.2	N12 04.5
Rigel	281 37.6	S 8 13.6
Rigil Kent.	140 29.0	S60 44.4
Sabik	102 43.7	S15 41.7
Schedar	350 10.7	N56 25.2
Shaula	96 58.7	S37 05.2
Sirius	258 57.2	S16 41.1
Spica	158 59.9	S11 02.6
Suhail	223 12.1	S43 20.4
Vega	80 57.4	N38 46.1
Zuben'ubi	137 35.5	S15 56.8

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	151 45.8	10 37
Mars	231 43.0	5 16
Jupiter	263 49.4	3 08
Saturn	207 48.7	6 52

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G.M.T.		SUN		MOON				
		G.H.A.	Dec.	G.H.A.	v	Dec.	d	H.P.
d h		° ′	° ′	° ′	′	° ′	′	′
9 00		184 02.6	S16 45.8	214 03.7	9.3	S 5 58.0	10.6	59.3
01		199 02.6	46.5	228 32.0	9.2	6 08.6	10.7	59.4
02		214 02.5	47.2	243 00.2	9.2	6 19.3	10.7	59.4
03		229 02.5	·· 48.0	257 28.4	9.1	6 30.0	10.6	59.4
04		244 02.4	48.7	271 56.5	9.0	6 40.6	10.6	59.5
05		259 02.4	49.4	286 24.5	9.0	6 51.2	10.5	59.5
06		274 02.3	S16 50.1	300 52.5	8.8	S 7 01.7	10.6	59.5
07	W	289 02.3	50.8	315 20.3	8.9	7 12.3	10.5	59.6
08	E	304 02.2	51.5	329 48.2	8.7	7 22.8	10.4	59.6
09	D	319 02.2	·· 52.3	344 15.9	8.7	7 33.2	10.5	59.6
10	N	334 02.1	53.0	358 43.6	8.6	7 43.7	10.4	59.7
11	E	349 02.1	53.7	13 11.2	8.5	7 54.1	10.4	59.7
12	S	4 02.0	S16 54.4	27 38.7	8.5	S 8 04.5	10.3	59.7
13	D	19 02.0	55.1	42 06.2	8.4	8 14.8	10.3	59.8
14	A	34 01.9	55.8	56 33.6	8.3	8 25.1	10.2	59.8
15	Y	49 01.8	·· 56.5	71 00.9	8.3	8 35.3	10.2	59.8
16		64 01.8	57.2	85 28.2	8.2	8 45.5	10.2	59.9
17		79 01.7	58.0	99 55.4	8.1	8 55.7	10.1	59.9
18		94 01.7	S16 58.7	114 22.5	8.0	S 9 05.8	10.1	59.9
19		109 01.6	16 59.4	128 49.5	8.0	9 15.9	10.0	60.0
20		124 01.6	17 00.1	143 16.5	7.9	9 25.9	10.0	60.0
21		139 01.5	·· 00.8	157 43.4	7.8	9 35.9	10.0	60.0
22		154 01.4	01.5	172 10.2	7.8	9 45.9	9.9	60.0
23		169 01.4	02.2	186 37.0	7.7	9 55.8	9.8	60.1
10 00		184 01.3	S17 02.9	201 03.7	7.6	S10 05.6	9.8	60.1
01		199 01.3	03.6	215 30.3	7.5	10 15.4	9.7	60.1
02		214 01.2	04.3	229 56.8	7.5	10 25.1	9.6	60.2
03		229 01.1	·· 05.0	244 23.3	7.4	10 34.7	9.6	60.2
04		244 01.1	05.7	258 49.7	7.3	10 44.3	9.6	60.2
05		259 01.0	06.4	273 16.0	7.2	10 53.9	9.5	60.2
06		274 01.0	S17 07.1	287 42.2	7.2	S11 03.4	9.4	60.3
07		289 00.9	07.8	302 08.4	7.1	11 12.8	9.3	60.3
08	T	304 00.8	08.5	316 34.5	7.0	11 22.1	9.3	60.3
09	H	319 00.8	·· 09.2	331 00.5	7.0	11 31.4	9.3	60.4
10	U	334 00.7	09.9	345 26.5	6.9	11 40.7	9.1	60.4
11	R	349 00.7	10.6	359 52.4	6.8	11 49.8	9.1	60.4
12	S	4 00.6	S17 11.4	14 18.2	6.7	S11 58.9	9.0	60.4
13	D	19 00.5	12.1	28 43.9	6.7	12 07.9	8.9	60.5
14	A	34 00.5	12.8	43 09.6	6.6	12 16.8	8.9	60.5
15	Y	49 00.4	·· 13.4	57 35.2	6.5	12 25.7	8.8	60.5
16		64 00.3	14.1	72 00.7	6.5	12 34.5	8.7	60.5
17		79 00.3	14.8	86 26.2	6.4	12 43.2	8.6	60.5
18		94 00.2	S17 15.5	100 51.6	6.3	S12 51.8	8.6	60.6
19		109 00.1	16.2	115 16.9	6.3	13 00.4	8.4	60.6
20		124 00.1	16.9	129 42.2	6.1	13 08.8	8.4	60.6
21		139 00.0	·· 17.6	144 07.3	6.2	13 17.2	8.3	60.6
22		153 59.9	18.3	158 32.5	6.0	13 25.5	8.2	60.6
23		168 59.9	19.0	172 57.5	6.0	13 33.7	8.2	60.7
11 00		183 59.8	S17 19.7	187 22.5	5.9	S13 41.9	8.0	60.7
01		198 59.7	20.4	201 47.4	5.8	13 49.9	8.0	60.7
02		213 59.7	21.1	216 12.2	5.8	13 57.9	7.8	60.7
03		228 59.6	·· 21.8	230 37.0	5.8	14 05.7	7.8	60.7
04		243 59.5	22.5	245 01.8	5.6	14 13.5	7.6	60.8
05		258 59.5	23.2	259 26.4	5.6	14 21.1	7.6	60.8
06		273 59.4	S17 23.9	273 51.0	5.5	S14 28.7	7.5	60.8
07		288 59.3	24.6	288 15.5	5.5	14 36.2	7.4	60.8
08		303 59.3	25.3	302 40.0	5.4	14 43.6	7.3	60.8
09	F	318 59.2	·· 25.9	317 04.4	5.3	14 50.9	7.1	60.8
10	R	333 59.1	26.6	331 28.7	5.3	14 58.0	7.1	60.8
11	I	348 59.0	27.3	345 53.0	5.3	15 05.1	7.0	60.9
12	D	3 59.0	S17 28.0	0 17.3	5.1	S15 12.1	6.8	60.9
13	A	18 58.9	28.7	14 41.4	5.1	15 18.9	6.8	60.9
14	Y	33 58.8	29.4	29 05.5	5.1	15 25.7	6.7	60.9
15		48 58.7	·· 30.1	43 29.6	5.0	15 32.4	6.5	60.9
16		63 58.7	30.8	57 53.6	5.0	15 38.9	6.4	60.9
17		78 58.6	31.4	72 17.6	4.9	15 45.3	6.4	60.9
18		93 58.5	S17 32.1	86 41.5	4.8	S15 51.7	6.2	60.9
19		108 58.5	32.8	101 05.3	4.8	15 57.9	6.1	61.0
20		123 58.4	33.5	115 29.1	4.7	16 04.0	6.0	61.0
21		138 58.3	·· 34.2	129 52.8	4.7	16 10.0	5.8	61.0
22		153 58.2	34.9	144 16.5	4.7	16 15.8	5.8	61.0
23		168 58.1	35.6	158 40.2	4.6	16 21.6	5.6	61.0
		S.D. 16.2	d 0.7	S.D. 16.3		16.5		16.6

Lat.	Twilight		Sunrise	Moonrise			
	Naut.	Civil		9	10	11	12
°	h m	h m	h m	h m	h m	h m	h m
N 72	06 41	08 10	10 01	05 25	07 27	09 38	12 08
N 70	06 33	07 51	09 18	05 14	07 06	09 02	10 55
68	06 26	07 36	08 49	05 06	06 50	08 37	10 18
66	06 20	07 24	08 28	04 59	06 38	08 17	09 52
64	06 15	07 14	08 11	04 52	06 27	08 02	09 31
62	06 11	07 05	07 57	04 47	06 18	07 49	09 15
60	06 07	06 57	07 45	04 43	06 10	07 38	09 01
N 58	06 03	06 51	07 35	04 39	06 04	07 29	08 50
56	05 59	06 45	07 26	04 35	05 58	07 20	08 39
54	05 56	06 39	07 18	04 32	05 52	07 13	08 31
52	05 53	06 34	07 11	04 29	05 48	07 06	08 23
50	05 50	06 29	07 04	04 27	05 43	07 01	08 15
45	05 44	06 19	06 51	04 21	05 34	06 48	08 00
N 40	05 38	06 11	06 39	04 16	05 26	06 37	07 48
35	05 32	06 03	06 29	04 12	05 20	06 28	07 37
30	05 27	05 56	06 21	04 09	05 14	06 21	07 28
20	05 16	05 43	06 06	04 03	05 04	06 07	07 12
N 10	05 06	05 31	05 53	03 58	04 55	05 56	06 58
0	04 54	05 19	05 40	03 53	04 47	05 45	06 45
S 10	04 40	05 06	05 28	03 48	04 39	05 34	06 32
20	04 24	04 51	05 14	03 43	04 31	05 22	06 18
30	04 02	04 33	04 59	03 37	04 21	05 09	06 03
35	03 49	04 22	04 50	03 33	04 15	05 02	05 54
40	03 33	04 09	04 39	03 30	04 09	04 53	05 43
45	03 12	03 54	04 27	03 25	04 02	04 43	05 31
S 50	02 45	03 34	04 12	03 20	03 53	04 32	05 17
52	02 31	03 25	04 05	03 18	03 49	04 26	05 10
54	02 14	03 14	03 57	03 15	03 45	04 20	05 03
56	01 54	03 01	03 48	03 13	03 40	04 13	04 54
58	01 26	02 47	03 38	03 09	03 35	04 06	04 45
S 60	00 44	02 29	03 27	03 06	03 29	03 57	04 34

Lat.	Sunset	Twilight		Moonset			
		Civil	Naut.	9	10	11	12
°	h m	h m	h m	h m	h m	h m	h m
N 72	13 25	15 16	16 46	14 23	14 16	14 07	13 44
N 70	14 09	15 35	16 54	14 36	14 38	14 43	14 57
68	14 38	15 50	17 01	14 46	14 55	15 10	15 35
66	14 59	16 03	17 07	14 55	15 09	15 30	16 01
64	15 16	16 13	17 12	15 02	15 21	15 46	16 22
62	15 30	16 22	17 16	15 09	15 31	15 59	16 39
60	15 42	16 30	17 20	15 14	15 39	16 11	16 53
N 58	15 52	16 37	17 24	15 19	15 47	16 21	17 05
56	16 01	16 43	17 28	15 23	15 53	16 30	17 15
54	16 09	16 48	17 31	15 27	15 59	16 37	17 24
52	16 17	16 53	17 34	15 31	16 05	16 44	17 33
50	16 23	16 58	17 37	15 34	16 09	16 51	17 40
45	16 37	17 08	17 43	15 41	16 20	17 04	17 56
N 40	16 48	17 17	17 49	15 47	16 29	17 16	18 09
35	16 58	17 25	17 55	15 52	16 36	17 25	18 20
30	17 07	17 32	18 01	15 57	16 43	17 34	18 29
20	17 22	17 45	18 11	16 05	16 54	17 48	18 46
N 10	17 35	17 57	18 22	16 12	17 05	18 01	19 01
0	17 47	18 09	18 34	16 18	17 14	18 13	19 14
S 10	18 00	18 22	18 48	16 25	17 24	18 25	19 28
20	18 14	18 37	19 05	16 32	17 34	18 38	19 42
30	18 29	18 55	19 26	16 39	17 45	18 52	19 59
35	18 39	19 06	19 40	16 44	17 52	19 01	20 09
40	18 49	19 19	19 56	16 49	18 00	19 11	20 20
45	19 02	19 35	20 17	16 55	18 09	19 22	20 33
S 50	19 17	19 55	20 45	17 03	18 20	19 36	20 48
52	19 24	20 05	20 59	17 06	18 25	19 42	20 56
54	19 32	20 16	21 16	17 10	18 30	19 50	21 04
56	19 41	20 28	21 37	17 14	18 36	19 58	21 13
58	19 51	20 43	22 06	17 18	18 43	20 07	21 24
S 60	20 03	21 01	22 53	17 23	18 51	20 17	21 36

Day	SUN			MOON			
	Eqn. of Time		Mer.	Mer. Pass.		Age	Phase
	00ʰ	12ʰ	Pass.	Upper	Lower		
	m s	m s	h m	h m	h m	d	
9	16 11	16 08	11 44	10 05	22 33	28	●
10	16 05	16 03	11 44	11 01	23 29	29	
11	15 59	15 56	11 44	11 59	24 29	00	

G.M.T.	ARIES	VENUS −3.4		MARS +0.2		JUPITER −2.2		SATURN +0.8	
	G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
d h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
12 00	51 00.6	200 23.8	S10 56.6	282 01.6	N20 29.3	314 57.6	N22 59.3	258 42.9	N12 42.9
01	66 03.0	215 23.3	57.7	297 03.2	29.2	330 00.2	59.3	273 45.2	42.9
02	81 05.5	230 22.8	58.8	312 04.8	29.0	345 02.8	59.4	288 47.5	42.8
03	96 08.0	245 22.3	10 59.9	327 06.4	· · 28.9	0 05.4	· · 59.4	303 49.9	· · 42.8
04	111 10.4	260 21.8	11 01.0	342 08.0	28.8	15 08.1	59.4	318 52.2	42.7
05	126 12.9	275 21.3	02.1	357 09.6	28.7	30 10.7	59.4	333 54.5	42.7
06	141 15.4	290 20.8	S11 03.3	12 11.2	N20 28.6	45 13.3	N22 59.4	348 56.9	N12 42.7
07	156 17.8	305 20.2	04.4	27 12.8	28.5	60 16.0	59.4	3 59.2	42.6
S 08	171 20.3	320 19.7	05.5	42 14.5	28.3	75 18.6	59.4	19 01.5	42.6
A 09	186 22.7	335 19.2	· · 06.6	57 16.1	· · 28.2	90 21.2	· · 59.4	34 03.9	· · 42.6
T 10	201 25.2	350 18.7	07.7	72 17.7	28.1	105 23.9	59.4	49 06.2	42.5
U 11	216 27.7	5 18.2	08.8	87 19.3	28.0	120 26.5	59.4	64 08.5	42.5
R 12	231 30.1	20 17.7	S11 09.9	102 20.9	N20 27.9	135 29.1	N22 59.5	79 10.9	N12 42.4
D 13	246 32.6	35 17.1	11.0	117 22.5	27.8	150 31.8	59.5	94 13.2	42.4
A 14	261 35.1	50 16.6	12.1	132 24.2	27.6	165 34.4	59.5	109 15.5	42.4
Y 15	276 37.5	65 16.1	· · 13.2	147 25.8	· · 27.5	180 37.0	· · 59.5	124 17.9	· · 42.3
16	291 40.0	80 15.6	14.4	162 27.4	27.4	195 39.7	59.5	139 20.2	42.3
17	306 42.5	95 15.1	15.5	177 29.0	27.3	210 42.3	59.5	154 22.6	42.3
18	321 44.9	110 14.5	S11 16.6	192 30.7	N20 27.2	225 45.0	N22 59.5	169 24.9	N12 42.2
19	336 47.4	125 14.0	17.7	207 32.3	27.1	240 47.6	59.5	184 27.2	42.2
20	351 49.9	140 13.5	18.8	222 33.9	26.9	255 50.2	59.5	199 29.6	42.1
21	6 52.3	155 13.0	· · 19.9	237 35.5	· · 26.8	270 52.9	· · 59.5	214 31.9	· · 42.1
22	21 54.8	170 12.4	21.0	252 37.2	26.7	285 55.5	59.6	229 34.2	42.1
23	36 57.2	185 11.9	22.1	267 38.8	26.6	300 58.1	59.6	244 36.6	42.0
13 00	51 59.7	200 11.4	S11 23.2	282 40.4	N20 26.5	316 00.8	N22 59.6	259 38.9	N12 42.0
01	67 02.2	215 10.9	24.3	297 42.0	26.4	331 03.4	59.6	274 41.3	42.0
02	82 04.6	230 10.4	25.4	312 43.7	26.3	346 06.1	59.6	289 43.6	41.9
03	97 07.1	245 09.8	· · 26.5	327 45.3	· · 26.1	1 08.7	· · 59.6	304 45.9	· · 41.9
04	112 09.6	260 09.3	27.6	342 46.9	26.0	16 11.3	59.6	319 48.3	41.8
05	127 12.0	275 08.8	28.7	357 48.6	25.9	31 14.0	59.6	334 50.6	41.8
06	142 14.5	290 08.2	S11 29.8	12 50.2	N20 25.8	46 16.6	N22 59.6	349 53.0	N12 41.8
07	157 17.0	305 07.7	30.9	27 51.8	25.7	61 19.3	59.6	4 55.3	41.7
08	172 19.4	320 07.2	32.0	42 53.5	25.6	76 21.9	59.7	19 57.6	41.7
S 09	187 21.9	335 06.7	· · 33.1	57 55.1	· · 25.5	91 24.5	· · 59.7	35 00.0	· · 41.7
U 10	202 24.4	350 06.1	34.2	72 56.8	25.3	106 27.2	59.7	50 02.3	41.6
N 11	217 26.8	5 05.6	35.3	87 58.4	25.2	121 29.8	59.7	65 04.6	41.6
D 12	232 29.3	20 05.1	S11 36.4	103 00.0	N20 25.1	136 32.5	N22 59.7	80 07.0	N12 41.6
A 13	247 31.7	35 04.6	37.5	118 01.7	25.0	151 35.1	59.7	95 09.3	41.5
Y 14	262 34.2	50 04.0	38.6	133 03.3	24.9	166 37.7	59.7	110 11.7	41.5
15	277 36.7	65 03.5	· · 39.7	148 05.0	· · 24.8	181 40.4	· · 59.7	125 14.0	· · 41.4
16	292 39.1	80 03.0	40.8	163 06.6	24.7	196 43.0	59.7	140 16.4	41.4
17	307 41.6	95 02.4	41.9	178 08.2	24.6	211 45.7	59.7	155 18.7	41.4
18	322 44.1	110 01.9	S11 43.0	193 09.9	N20 24.5	226 48.3	N22 59.8	170 21.0	N12 41.3
19	337 46.5	125 01.4	44.1	208 11.5	24.3	241 51.0	59.8	185 23.4	41.3
20	352 49.0	140 00.8	45.2	223 13.2	24.2	256 53.6	59.8	200 25.7	41.3
21	7 51.5	155 00.3	· · 46.3	238 14.8	· · 24.1	271 56.3	· · 59.8	215 28.1	· · 41.2
22	22 53.9	169 59.8	47.4	253 16.5	24.0	286 58.9	59.8	230 30.4	41.2
23	37 56.4	184 59.2	48.5	268 18.1	23.9	302 01.6	59.8	245 32.7	41.2
14 00	52 58.8	199 58.7	S11 49.6	283 19.8	N20 23.8	317 04.2	N22 59.8	260 35.1	N12 41.1
01	68 01.3	214 58.2	50.7	298 21.4	23.7	332 06.8	59.8	275 37.4	41.1
02	83 03.8	229 57.6	51.7	313 23.1	23.6	347 09.5	59.8	290 39.8	41.1
03	98 06.2	244 57.1	· · 52.8	328 24.7	· · 23.5	2 12.1	· · 59.9	305 42.1	· · 41.0
04	113 08.7	259 56.6	53.9	343 26.4	23.4	17 14.8	59.9	320 44.5	41.0
05	128 11.2	274 56.0	55.0	358 28.0	23.2	32 17.4	59.9	335 46.8	40.9
06	143 13.6	289 55.5	S11 56.1	13 29.7	N20 23.1	47 20.1	N22 59.9	350 49.1	N12 40.9
07	158 16.1	304 55.0	57.2	28 31.3	23.0	62 22.7	59.9	5 51.5	40.9
08	173 18.6	319 54.4	58.3	43 33.0	22.9	77 25.4	59.9	20 53.8	40.8
M 09	188 21.0	334 53.9	11 59.4	58 34.7	· · 22.8	92 28.0	· · 59.9	35 56.2	· · 40.8
O 10	203 23.5	349 53.4	12 00.5	73 36.3	22.7	107 30.7	59.9	50 58.5	40.8
N 11	218 26.0	4 52.8	01.5	88 38.0	22.6	122 33.3	59.9	66 00.9	40.7
D 12	233 28.4	19 52.3	S12 02.6	103 39.6	N20 22.5	137 36.0	N22 59.9	81 03.2	N12 40.7
A 13	248 30.9	34 51.7	03.7	118 41.3	22.4	152 38.6	23 00.0	96 05.5	40.7
Y 14	263 33.3	49 51.2	04.8	133 43.0	22.3	167 41.3	00.0	111 07.9	40.6
15	278 35.8	64 50.7	· · 05.9	148 44.6	· · 22.2	182 43.9	· · 00.0	126 10.2	· · 40.6
16	293 38.3	79 50.1	07.0	163 46.3	22.1	197 46.6	00.0	141 12.6	40.6
17	308 40.7	94 49.6	08.1	178 47.9	22.0	212 49.2	00.0	156 14.9	40.5
18	323 43.2	109 49.0	S12 09.1	193 49.6	N20 21.8	227 51.9	N23 00.0	171 17.3	N12 40.5
19	338 45.7	124 48.5	10.2	208 51.3	21.7	242 54.6	00.0	186 19.6	40.5
20	353 48.1	139 48.0	11.3	223 52.9	21.6	257 57.2	00.0	201 22.0	40.4
21	8 50.6	154 47.4	· · 12.4	238 54.6	· · 21.5	272 59.9	· · 00.0	216 24.3	· · 40.4
22	23 53.1	169 46.9	13.5	253 56.3	21.4	288 02.5	00.1	231 26.6	40.4
23	38 55.5	184 46.3	14.6	268 57.9	21.3	303 05.2	00.1	246 29.0	40.3
Mer. Pass.	h m 20 28.7	*v* −0.5	*d* 1.1	*v* 1.6	*d* 0.1	*v* 2.6	*d* 0.0	*v* 2.3	*d* 0.0

STARS

Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 38.3	S40 23.6
Achernar	335 46.3	S57 21.1
Acrux	173 39.7	S62 58.3
Adhara	255 33.4	S28 56.4
Aldebaran	291 19.9	N16 27.9
Alioth	166 44.8	N56 04.7
Alkaid	153 20.6	N49 25.4
Al Na'ir	28 17.4	S47 04.2
Alnilam	276 13.3	S 1 13.0
Alphard	218 22.4	S 8 33.7
Alphecca	126 34.1	N26 47.5
Alpheratz	358 11.0	N28 58.3
Altair	62 34.6	N 8 48.8
Ankaa	353 41.9	S42 25.7
Antares	112 59.6	S26 22.9
Arcturus	146 20.6	N19 17.9
Atria	108 26.0	S68 59.3
Avior	234 28.7	S59 26.1
Bellatrix	279 00.5	N 6 19.8
Betelgeuse	271 30.1	N 7 24.2
Canopus	264 07.6	S52 40.9
Capella	281 13.7	N45 58.4
Deneb	49 49.8	N45 12.5
Denebola	183 01.2	N14 41.7
Diphda	349 22.6	S18 06.5
Dubhe	194 24.9	N61 52.0
Elnath	278 46.2	N28 35.3
Eltanin	90 59.1	N51 29.8
Enif	34 13.5	N 9 46.6
Fomalhaut	15 53.5	S29 44.4
Gacrux	172 31.2	S56 59.1
Gienah	176 20.2	S17 25.0
Hadar	149 26.6	S60 15.8
Hamal	328 30.7	N23 21.6
Kaus Aust.	84 19.7	S34 23.7
Kochab	137 20.3	N74 14.8
Markab	14 04.9	N15 05.4
Menkar	314 42.8	N 4 00.2
Menkent	148 39.6	S36 15.5
Miaplacidus	221 45.1	S69 37.3
Mirfak	309 18.3	N49 47.0
Nunki	76 31.8	S26 19.4
Peacock	54 01.7	S56 48.5
Pollux	244 00.4	N28 04.6
Procyon	245 27.7	N 5 16.9
Rasalhague	96 31.7	N12 34.8
Regulus	208 12.1	N12 04.5
Rigel	281 37.6	S 8 13.6
Rigil Kent.	140 29.0	S60 44.4
Sabik	102 43.7	S15 41.7
Schedar	350 10.7	N56 25.2
Shaula	96 58.7	S37 05.2
Sirius	258 57.2	S16 41.1
Spica	158 59.9	S11 02.6
Suhail	223 12.1	S43 20.4
Vega	80 57.4	N38 46.1
Zuben'ubi	137 35.5	S15 56.8

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	148 11.7	10 40
Mars	230 40.7	5 09
Jupiter	264 01.1	2 55
Saturn	207 39.2	6 40

1977 NOVEMBER 12, 13, 14 (SAT., SUN., MON.)

G.M.T.			SUN G.H.A.	SUN Dec.	MOON G.H.A.	MOON v	MOON Dec.	MOON d	MOON H.P.
d		h	° ′	° ′	° ′	′	° ′	′	′
12		00	183 58.1	S17 36.2	173 03.8	4.6	S16 27.2	5.6	61.0
		01	198 58.0	36.9	187 27.4	4.5	16 32.8	5.4	61.0
		02	213 57.9	37.6	201 50.9	4.5	16 38.2	5.2	61.0
		03	228 57.8	· · 38.3	216 14.4	4.4	16 43.4	5.2	61.0
		04	243 57.8	39.0	230 37.8	4.4	16 48.6	5.0	61.0
		05	258 57.7	39.6	245 01.2	4.3	16 53.6	5.0	61.0
		06	273 57.6	S17 40.3	259 24.5	4.4	S16 58.6	4.8	61.0
		07	288 57.5	41.0	273 47.9	4.3	17 03.4	4.6	61.0
	S	08	303 57.4	41.7	288 11.2	4.2	17 08.0	4.6	61.0
	A	09	318 57.4	· · 42.3	302 34.4	4.2	17 12.6	4.4	61.0
	T	10	333 57.3	43.0	316 57.6	4.2	17 17.0	4.3	61.0
	U	11	348 57.2	43.7	331 20.8	4.2	17 21.3	4.1	61.0
	R	12	3 57.1	S17 44.4	345 44.0	4.1	S17 25.4	4.1	61.0
	D	13	18 57.0	45.1	0 07.1	4.1	17 29.5	3.9	61.0
	A	14	33 57.0	45.7	14 30.2	4.1	17 33.4	3.7	61.0
	Y	15	48 56.9	· · 46.4	28 53.3	4.1	17 37.1	3.7	61.0
		16	63 56.8	47.1	43 16.4	4.0	17 40.8	3.5	61.0
		17	78 56.7	47.7	57 39.4	4.0	17 44.3	3.4	61.0
		18	93 56.6	S17 48.4	72 02.4	4.0	S17 47.7	3.2	61.0
		19	108 56.6	49.1	86 25.4	4.0	17 50.9	3.1	61.0
		20	123 56.5	49.8	100 48.4	4.0	17 54.0	3.0	61.0
		21	138 56.4	· · 50.4	115 11.4	3.9	17 57.0	2.9	61.0
		22	153 56.3	51.1	129 34.3	4.0	17 59.9	2.7	61.0
		23	168 56.2	51.8	143 57.3	3.9	18 02.6	2.6	61.0
13		00	183 56.1	S17 52.4	158 20.2	3.9	S18 05.2	2.4	61.0
		01	198 56.0	53.1	172 43.1	3.9	18 07.6	2.3	61.0
		02	213 56.0	53.8	187 06.0	3.9	18 09.9	2.2	61.0
		03	228 55.9	· · 54.4	201 28.9	4.0	18 12.1	2.1	61.0
		04	243 55.8	55.1	215 51.9	3.9	18 14.2	1.9	61.0
		05	258 55.7	55.8	230 14.8	3.9	18 16.1	1.7	61.0
		06	273 55.6	S17 56.4	244 37.7	3.9	S18 17.8	1.7	60.9
		07	288 55.5	57.1	259 00.6	3.9	18 19.5	1.5	60.9
		08	303 55.4	57.8	273 23.5	3.9	18 21.0	1.3	60.9
	S	09	318 55.3	· · 58.4	287 46.4	3.9	18 22.3	1.3	60.9
	U	10	333 55.3	59.1	302 09.3	3.9	18 23.6	1.0	60.9
	N	11	348 55.2	17 59.8	316 32.2	4.0	18 24.6	1.0	60.9
	D	12	3 55.1	S18 00.4	330 55.2	3.9	S18 25.6	0.8	60.9
	A	13	18 55.0	01.1	345 18.1	4.0	18 26.4	0.7	60.9
	Y	14	33 54.9	01.8	359 41.1	4.0	18 27.1	0.5	60.9
		15	48 54.8	· · 02.4	14 04.1	4.0	18 27.6	0.5	60.8
		16	63 54.7	03.1	28 27.1	4.0	18 28.1	0.2	60.8
		17	78 54.6	03.7	42 50.1	4.0	18 28.3	0.2	60.8
		18	93 54.5	S18 04.4	57 13.1	4.1	S18 28.5	0.0	60.8
		19	108 54.4	05.1	71 36.2	4.0	18 28.5	0.2	60.8
		20	123 54.3	05.7	85 59.2	4.1	18 28.3	0.2	60.8
		21	138 54.3	· · 06.4	100 22.3	4.2	18 28.1	0.4	60.8
		22	153 54.2	07.0	114 45.5	4.1	18 27.7	0.6	60.7
		23	168 54.1	07.7	129 08.6	4.2	18 27.1	0.7	60.7
14		00	183 54.0	S18 08.3	143 31.8	4.2	S18 26.4	0.8	60.7
		01	198 53.9	09.0	157 55.0	4.3	18 25.6	0.9	60.7
		02	213 53.8	09.7	172 18.3	4.2	18 24.7	1.1	60.7
		03	228 53.7	· · 10.3	186 41.5	4.4	18 23.6	1.2	60.6
		04	243 53.6	11.0	201 04.9	4.3	18 22.4	1.3	60.6
		05	258 53.5	11.6	215 28.2	4.4	18 21.1	1.5	60.6
		06	273 53.4	S18 12.3	229 51.6	4.4	S18 19.6	1.6	60.6
		07	288 53.3	12.9	244 15.0	4.5	18 18.0	1.7	60.6
		08	303 53.2	13.6	258 38.5	4.5	18 16.3	1.9	60.6
	M	09	318 53.1	· · 14.2	273 02.0	4.6	18 14.4	2.0	60.5
	O	10	333 53.0	14.9	287 25.6	4.6	18 12.4	2.1	60.5
	N	11	348 52.9	15.5	301 49.2	4.6	18 10.3	2.3	60.5
	D	12	3 52.8	S18 16.2	316 12.8	4.7	S18 08.0	2.3	60.5
	A	13	18 52.7	16.8	330 36.5	4.8	18 05.7	2.5	60.4
	Y	14	33 52.6	17.5	345 00.3	4.8	18 03.2	2.7	60.4
		15	48 52.5	· · 18.1	359 24.1	4.8	18 00.5	2.7	60.4
		16	63 52.4	18.8	13 47.9	4.9	17 57.8	2.9	60.4
		17	78 52.3	19.4	28 11.8	5.0	17 54.9	3.0	60.4
		18	93 52.2	S18 20.1	42 35.8	5.0	S17 51.9	3.1	60.3
		19	108 52.1	20.7	56 59.8	5.1	17 48.8	3.3	60.3
		20	123 52.0	21.3	71 23.9	5.1	17 45.5	3.3	60.3
		21	138 51.9	· · 22.0	85 48.0	5.2	17 42.2	3.5	60.3
		22	153 51.8	22.6	100 12.2	5.3	17 38.7	3.6	60.2
		23	168 51.7	23.3	114 36.5	5.3	17 35.1	3.8	60.2
			S.D. 16.2	*d* 0.7	S.D. 16.6		16.6		16.5

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 12	Moonrise 13	Moonrise 14	Moonrise 15
°	h m	h m	h m	h m	h m	h m	h m
N 72	06 52	08 24	10 32	12 08	■	■	14 23
N 70	06 42	08 03	09 36	10 55	12 28	13 18	13 37
68	06 35	07 47	09 03	10 18	11 41	12 36	13 06
66	06 28	07 33	08 39	09 52	11 11	12 07	12 44
64	06 22	07 22	08 21	09 31	10 48	11 46	12 26
62	06 17	07 12	08 05	09 15	10 30	11 28	12 11
60	06 13	07 04	07 53	09 01	10 14	11 13	11 58
N 58	06 09	06 57	07 42	08 50	10 02	11 01	11 47
56	06 05	06 50	07 32	08 39	09 51	10 50	11 38
54	06 01	06 44	07 24	08 31	09 41	10 41	11 30
52	05 58	06 39	07 16	08 23	09 32	10 32	11 22
50	05 55	06 34	07 09	08 15	09 24	10 25	11 15
45	05 48	06 23	06 55	08 00	09 08	10 08	11 01
N 40	05 41	06 14	06 43	07 48	08 54	09 55	10 49
35	05 35	06 06	06 32	07 37	08 43	09 44	10 38
30	05 29	05 58	06 23	07 28	08 33	09 34	10 29
20	05 18	05 44	06 08	07 12	08 16	09 17	10 14
N 10	05 06	05 32	05 54	06 58	08 01	09 02	10 00
0	04 54	05 19	05 41	06 45	07 47	08 48	09 48
S 10	04 39	05 05	05 28	06 32	07 33	08 34	09 35
20	04 22	04 50	05 13	06 18	07 18	08 19	09 21
30	04 00	04 31	04 57	06 03	07 01	08 02	09 06
35	03 46	04 20	04 48	05 54	06 51	07 53	08 57
40	03 29	04 06	04 37	05 43	06 40	07 41	08 46
45	03 07	03 50	04 24	05 31	06 26	07 28	08 34
S 50	02 38	03 29	04 08	05 17	06 10	07 12	08 20
52	02 23	03 19	04 00	05 10	06 03	07 04	08 13
54	02 05	03 08	03 52	05 03	05 54	06 56	08 05
56	01 43	02 54	03 43	04 54	05 45	06 46	07 57
58	01 11	02 39	03 32	04 45	05 34	06 36	07 47
S 60	00 06	02 20	03 20	04 34	05 22	06 23	07 36

Lat.	Sunset	Twilight Civil	Twilight Naut.	Moonset 12	Moonset 13	Moonset 14	Moonset 15
°	h m	h m	h m	h m	h m	h m	h m
N 72	12 56	15 03	16 36	13 44	■	■	17 50
N 70	13 52	15 24	16 45	14 57	15 33	16 52	18 36
68	14 25	15 41	16 53	15 35	16 21	17 33	19 05
66	14 49	15 54	16 59	16 01	16 51	18 02	19 28
64	15 07	16 06	17 05	16 22	17 14	18 23	19 45
62	15 23	16 15	17 10	16 39	17 32	18 40	19 59
60	15 35	16 24	17 15	16 53	17 47	18 55	20 12
N 58	15 46	16 31	17 19	17 05	18 00	19 07	20 22
56	15 56	16 38	17 23	17 15	18 11	19 18	20 31
54	16 04	16 44	17 27	17 24	18 21	19 27	20 39
52	16 12	16 49	17 30	17 33	18 30	19 35	20 46
50	16 19	16 54	17 33	17 40	18 38	19 43	20 53
45	16 33	17 05	17 40	17 56	18 54	19 59	21 07
N 40	16 46	17 14	17 47	18 09	19 08	20 12	21 18
35	16 56	17 23	17 53	18 20	19 19	20 23	21 28
30	17 05	17 30	17 59	18 29	19 29	20 32	21 36
20	17 21	17 44	18 11	18 46	19 47	20 49	21 51
N 10	17 35	17 57	18 22	19 01	20 02	21 03	22 03
0	17 48	18 10	18 35	19 14	20 16	21 17	22 15
S 10	18 01	18 23	18 49	19 28	20 30	21 30	22 27
20	18 15	18 39	19 07	19 42	20 45	21 44	22 39
30	18 32	18 58	19 29	19 59	21 02	22 01	22 54
35	18 42	19 09	19 43	20 09	21 12	22 10	23 02
40	18 53	19 23	20 01	20 20	21 24	22 21	23 11
45	19 06	19 40	20 22	20 33	21 37	22 34	23 22
S 50	19 22	20 01	20 52	20 48	21 53	22 49	23 35
52	19 30	20 11	21 07	20 56	22 01	22 56	23 41
54	19 38	20 23	21 26	21 04	22 09	23 04	23 48
56	19 47	20 36	21 49	21 13	22 19	23 13	23 55
58	19 58	20 52	22 22	21 24	22 30	23 23	24 04
S 60	20 11	21 12	////	21 36	22 42	23 34	24 13

Day	SUN Eqn. of Time 00ʰ	SUN Eqn. of Time 12ʰ	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
	m s	m s	h m	h m	h m	d	
12	15 52	15 49	11 44	13 00	00 29	01	◐
13	15 45	15 40	11 44	14 01	01 30	02	
14	15 36	15 31	11 44	15 02	02 32	03	

1977 NOVEMBER 15, 16, 17 (TUES., WED., THURS.)

G.M.T.		ARIES	VENUS −3.4		MARS +0.2		JUPITER −2.2		SATURN +0.8	
		G.H.A.	G.H.A.	Dec.	G.H.A.	Dec	G.H.A.	Dec	G.H.A.	Dec
d	h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
15	00	53 58.0	199 45.8	S12 15.6	283 59.6	N20 21.2	318 07.8	N23 00.1	261 31.3	N12 40.3
	01	69 00.5	214 45.2	16.7	299 01.3	21.1	333 10.5	00.1	276 33.7	40.3
	02	84 02.9	229 44.7	17.8	314 03.0	21.0	348 13.1	00.1	291 36.0	40.2
	03	99 05.4	244 44.2	· · 18.9	329 04.6	· · 20.9	3 15.8	· · 00.1	306 38.4	· · 40.2
	04	114 07.8	259 43.6	20.0	344 06.3	20.8	18 18.4	00.1	321 40.7	40.2
	05	129 10.3	274 43.1	21.0	359 08.0	20.7	33 21.1	00.1	336 43.1	40.1
	06	144 12.8	289 42.5	S12 22.1	14 09.7	N20 20.6	48 23.8	N23 00.1	351 45.4	N12 40.1
	07	159 15.2	304 42.0	23.2	29 11.3	20.5	63 26.4	00.1	6 47.8	40.1
	08	174 17.7	319 41.4	24.3	44 13.0	20.4	78 29.1	00.2	21 50.1	40.0
T	09	189 20.2	334 40.9	· · 25.3	59 14.7	· · 20.3	93 31.7	· · 00.2	36 52.5	· · 40.0
U	10	204 22.6	349 40.3	26.4	74 16.4	20.2	108 34.4	00.2	51 54.8	40.0
E	11	219 25.1	4 39.8	27.5	89 18.1	20.1	123 37.0	00.2	66 57.2	39.9
S	12	234 27.6	19 39.2	S12 28.6	104 19.7	N20 20.0	138 39.7	N23 00.2	81 59.5	N12 39.9
D	13	249 30.0	34 38.7	29.6	119 21.4	19.9	153 42.4	00.2	97 01.9	39.9
A	14	264 32.5	49 38.1	30.7	134 23.1	19.8	168 45.0	00.2	112 04.2	39.8
Y	15	279 35.0	64 37.6	· · 31.8	149 24.8	· · 19.7	183 47.7	· · 00.2	127 06.5	· · 39.8
	16	294 37.4	79 37.0	32.9	164 26.5	19.6	198 50.3	00.2	142 08.9	39.8
	17	309 39.9	94 36.5	33.9	179 28.2	19.5	213 53.0	00.3	157 11.2	39.7
	18	324 42.3	109 35.9	S12 35.0	194 29.8	N20 19.4	228 55.7	N23 00.3	172 13.6	N12 39.7
	19	339 44.8	124 35.4	36.1	209 31.5	19.3	243 58.3	00.3	187 15.9	39.7
	20	354 47.3	139 34.8	37.2	224 33.2	19.1	259 01.0	00.3	202 18.3	39.6
	21	9 49.7	154 34.3	· · 38.2	239 34.9	· · 19.0	274 03.7	· · 00.3	217 20.6	· · 39.6
	22	24 52.2	169 33.7	39.3	254 36.6	18.9	289 06.3	00.3	232 23.0	39.6
	23	39 54.7	184 33.2	40.4	269 38.3	18.8	304 09.0	00.3	247 25.3	39.5
16	00	54 57.1	199 32.6	S12 41.4	284 40.0	N20 18.7	319 11.6	N23 00.3	262 27.7	N12 39.5
	01	69 59.6	214 32.1	42.5	299 41.7	18.6	334 14.3	00.3	277 30.0	39.5
	02	85 02.1	229 31.5	43.6	314 43.4	18.5	349 17.0	00.4	292 32.4	39.4
	03	100 04.5	244 31.0	· · 44.6	329 45.1	· · 18.4	4 19.6	· · 00.4	307 34.7	· · 39.4
	04	115 07.0	259 30.4	45.7	344 46.8	18.3	19 22.3	00.4	322 37.1	39.4
	05	130 09.4	274 29.8	46.8	359 48.4	18.2	34 25.0	00.4	337 39.4	39.3
	06	145 11.9	289 29.3	S12 47.8	14 50.1	N20 18.1	49 27.6	N23 00.4	352 41.8	N12 39.3
W	07	160 14.4	304 28.7	48.9	29 51.8	18.1	64 30.3	00.4	7 44.1	39.3
E	08	175 16.8	319 28.2	50.0	44 53.5	18.0	79 33.0	00.4	22 46.5	39.2
D	09	190 19.3	334 27.6	· · 51.0	59 55.2	· · 17.9	94 35.6	· · 00.4	37 48.9	· · 39.2
N	10	205 21.8	349 27.1	52.1	74 56.9	17.8	109 38.3	00.4	52 51.2	39.2
E	11	220 24.2	4 26.5	53.2	89 58.6	17.7	124 41.0	00.5	67 53.6	39.1
S	12	235 26.7	19 25.9	S12 54.2	105 00.3	N20 17.6	139 43.6	N23 00.5	82 55.9	N12 39.1
D	13	250 29.2	34 25.4	55.3	120 02.1	17.5	154 46.3	00.5	97 58.3	39.1
A	14	265 31.6	49 24.8	56.3	135 03.8	17.4	169 49.0	00.5	113 00.6	39.1
Y	15	280 34.1	64 24.3	· · 57.4	150 05.5	· · 17.3	184 51.6	· · 00.5	128 03.0	· · 39.0
	16	295 36.6	79 23.7	58.5	165 07.2	17.2	199 54.3	00.5	143 05.3	39.0
	17	310 39.0	94 23.1	12 59.5	180 08.9	17.1	214 57.0	00.5	158 07.7	39.0
	18	325 41.5	109 22.6	S13 00.6	195 10.6	N20 17.0	229 59.6	N23 00.5	173 10.0	N12 38.9
	19	340 43.9	124 22.0	01.6	210 12.3	16.9	245 02.3	00.5	188 12.4	38.9
	20	355 46.4	139 21.5	02.7	225 14.0	16.8	260 05.0	00.6	203 14.7	38.9
	21	10 48.9	154 20.9	· · 03.8	240 15.7	· · 16.7	275 07.6	· · 00.6	218 17.1	· · 38.8
	22	25 51.3	169 20.3	04.8	255 17.4	16.6	290 10.3	00.6	233 19.4	38.8
	23	40 53.8	184 19.8	05.9	270 19.1	16.5	305 13.0	00.6	248 21.8	38.8
17	00	55 56.3	199 19.2	S13 06.9	285 20.9	N20 16.4	320 15.7	N23 00.6	263 24.1	N12 38.7
	01	70 58.7	214 18.6	08.0	300 22.6	16.3	335 18.3	00.6	278 26.5	38.7
	02	86 01.2	229 18.1	09.0	315 24.3	16.2	350 21.0	00.6	293 28.9	38.7
	03	101 03.7	244 17.5	· · 10.1	330 26.0	· · 16.1	5 23.7	· · 00.6	308 31.2	· · 38.6
	04	116 06.1	259 16.9	11.1	345 27.7	16.0	20 26.3	00.6	323 33.6	38.6
	05	131 08.6	274 16.4	12.2	0 29.4	15.9	35 29.0	00.7	338 35.9	38.6
	06	146 11.1	289 15.8	S13 13.2	15 31.2	N20 15.8	50 31.7	N23 00.7	353 38.3	N12 38.6
	07	161 13.5	304 15.2	14.3	30 32.9	15.7	65 34.4	00.7	8 40.6	38.5
T	08	176 16.0	319 14.7	15.3	45 34.6	15.6	80 37.0	00.7	23 43.0	38.5
H	09	191 18.4	334 14.1	· · 16.4	60 36.3	· · 15.6	95 39.7	· · 00.7	38 45.3	· · 38.5
U	10	206 20.9	349 13.5	17.4	75 38.0	15.5	110 42.4	00.7	53 47.7	38.4
R	11	221 23.4	4 13.0	18.5	90 39.8	15.4	125 45.1	00.7	68 50.1	38.4
S	12	236 25.8	19 12.4	S13 19.5	105 41.5	N20 15.3	140 47.7	N23 00.7	83 52.4	N12 38.4
D	13	251 28.3	34 11.8	20.6	120 43.2	15.2	155 50.4	00.7	98 54.8	38.3
A	14	266 30.8	49 11.2	21.6	135 44.9	15.1	170 53.1	00.8	113 57.1	38.3
Y	15	281 33.2	64 10.7	· · 22.7	150 46.7	· · 15.0	185 55.8	· · 00.8	128 59.5	· · 38.3
	16	296 35.7	79 10.1	23.7	165 48.4	14.9	200 58.4	00.8	144 01.8	38.3
	17	311 38.2	94 09.5	24.8	180 50.1	14.8	216 01.1	00.8	159 04.2	38.2
	18	326 40.6	109 09.0	S13 25.8	195 51.9	N20 14.7	231 03.8	N23 00.8	174 06.5	N12 38.2
	19	341 43.1	124 08.4	26.9	210 53.6	14.6	246 06.5	00.8	189 08.9	38.2
	20	356 45.5	139 07.8	27.9	225 55.3	14.5	261 09.1	00.8	204 11.3	38.1
	21	11 48.0	154 07.2	· · 29.0	240 57.0	· · 14.5	276 11.8	· · 00.8	219 13.6	· · 38.1
	22	26 50.5	169 06.7	30.0	255 58.8	14.4	291 14.5	00.8	234 16.0	38.1
	23	41 52.9	184 06.1	31.0	271 00.5	14.3	306 17.2	00.9	249 18.3	38.0
Mer. Pass.		h m 20 16.9	v −0.6	d 1.1	v 1.7	d 0.1	v 2.7	d 0.0	v 2.4	d 0.0

STARS		
Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 38.3	S40 23.6
Achernar	335 46.3	S57 21.1
Acrux	173 39.7	S62 58.3
Adhara	255 33.4	S28 56.4
Aldebaran	291 19.9	N16 27.9
Alioth	166 44.7	N56 04.7
Alkaid	153 20.5	N49 25.4
Al Na'ir	28 17.4	S47 04.2
Alnilam	276 13.3	S 1 13.0
Alphard	218 22.4	S 8 33.7
Alphecca	126 34.1	N26 47.5
Alpheratz	358 11.1	N28 58.3
Altair	62 34.6	N 8 48.8
Ankaa	353 41.9	S42 25.7
Antares	112 59.6	S26 22.9
Arcturus	146 20.6	N19 17.9
Atria	108 26.0	S68 59.3
Avior	234 28.7	S59 26.1
Bellatrix	279 00.5	N 6 19.8
Betelgeuse	271 30.1	N 7 24.1
Canopus	264 07.6	S52 40.9
Capella	281 13.7	N45 58.4
Deneb	49 49.9	N45 12.5
Denebola	183 01.2	N14 41.7
Diphda	349 22.6	S18 06.5
Dubhe	194 24.9	N61 51.9
Elnath	278 46.2	N28 35.3
Eltanin	90 59.1	N51 29.8
Enif	34 13.5	N 9 46.6
Fomalhaut	15 53.5	S29 44.4
Gacrux	172 31.2	S56 59.1
Gienah	176 20.1	S17 25.0
Hadar	149 26.6	S60 15.8
Hamal	328 30.7	N23 21.6
Kaus Aust.	84 19.7	S34 23.7
Kochab	137 20.3	N74 14.8
Markab	14 05.0	N15 05.4
Menkar	314 42.8	N 4 00.2
Menkent	148 39.6	S36 15.5
Miaplacidus	221 45.1	S69 37.3
Mirfak	309 18.3	N49 47.0
Nunki	76 31.8	S26 19.4
Peacock	54 01.7	S56 48.5
Pollux	244 00.3	N28 04.6
Procyon	245 27.6	N 5 16.9
Rasalhague	96 31.7	N12 34.8
Regulus	208 12.1	N12 04.5
Rigel	281 37.6	S 8 13.6
Rigil Kent.	140 29.0	S60 44.4
Sabik	102 43.7	S15 41.7
Schedar	350 10.7	N56 25.2
Shaula	96 58.7	S37 05.2
Sirius	258 57.2	S16 41.1
Spica	158 59.8	S11 02.6
Suhail	223 12.1	S43 20.4
Vega	80 57.4	N38 46.1
Zuben'ubi	137 35.5	S15 56.8

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	144 35.5	10 42
Mars	229 42.8	5 01
Jupiter	264 14.5	2 43
Saturn	207 30.6	6 29

1977 NOVEMBER 15, 16, 17 (TUES., WED., THURS.)

G.M.T.			SUN		MOON				
			G.H.A.	Dec.	G.H.A.	*v*	Dec.	*d*	H.P.
d	h		° ′	° ′	° ′	′	° ′	′	′
15	00		183 51.6	S18 23.9	129 00.8	5.3	S17 31.3	3.8	60.2
	01		198 51.5	24.6	143 25.1	5.5	17 27.5	4.0	60.2
	02		213 51.4	25.2	157 49.6	5.5	17 23.5	4.0	60.1
	03		228 51.3	·· 25.8	172 14.1	5.5	17 19.5	4.2	60.1
	04		243 51.2	26.5	186 38.6	5.6	17 15.3	4.3	60.1
	05		258 51.1	27.1	201 03.2	5.7	17 11.0	4.5	60.0
	06		273 51.0	S18 27.8	215 27.9	5.8	S17 06.5	4.5	60.0
	07		288 50.9	28.4	229 52.7	5.8	17 02.0	4.6	60.0
	08	T	303 50.8	29.0	244 17.5	5.9	16 57.4	4.8	60.0
	09	U	318 50.7	·· 29.7	258 42.4	6.0	16 52.6	4.8	59.9
	10	E	333 50.6	30.3	273 07.4	6.0	16 47.8	5.0	59.9
	11	S	348 50.5	31.0	287 32.4	6.1	16 42.8	5.1	59.9
	12	D	3 50.4	S18 31.6	301 57.5	6.2	S16 37.7	5.2	59.9
	13	A	18 50.2	32.2	316 22.7	6.3	16 32.5	5.2	59.8
	14	Y	33 50.1	32.9	330 48.0	6.3	16 27.3	5.4	59.8
	15		48 50.0	·· 33.5	345 13.3	6.4	16 21.9	5.5	59.8
	16		63 49.9	34.1	359 38.7	6.5	16 16.4	5.6	59.7
	17		78 49.8	34.8	14 04.2	6.5	16 10.8	5.7	59.7
	18		93 49.7	S18 35.4	28 29.7	6.6	S16 05.1	5.8	59.7
	19		108 49.6	36.0	42 55.3	6.7	15 59.3	5.9	59.6
	20		123 49.5	36.7	57 21.0	6.8	15 53.4	6.0	59.6
	21		138 49.4	·· 37.3	71 46.8	6.8	15 47.4	6.1	59.6
	22		153 49.3	37.9	86 12.6	7.0	15 41.3	6.1	59.6
	23		168 49.2	38.6	100 38.6	7.0	15 35.2	6.3	59.5
16	00		183 49.0	S18 39.2	115 04.6	7.0	S15 28.9	6.4	59.5
	01		198 48.9	39.8	129 30.6	7.2	15 22.5	6.4	59.5
	02		213 48.8	40.4	143 56.8	7.2	15 16.1	6.6	59.4
	03		228 48.7	·· 41.1	158 23.0	7.3	15 09.5	6.6	59.4
	04		243 48.6	41.7	172 49.3	7.4	15 02.9	6.7	59.4
	05		258 48.5	42.3	187 15.7	7.5	14 56.2	6.8	59.3
	06		273 48.4	S18 42.9	201 42.2	7.5	S14 49.4	6.9	59.3
	07	W	288 48.3	43.6	216 08.7	7.6	14 42.5	7.0	59.3
	08	E	303 48.1	44.2	230 35.3	7.7	14 35.5	7.0	59.2
	09	D	318 48.0	·· 44.8	245 02.0	7.8	14 28.5	7.2	59.2
	10	N	333 47.9	45.4	259 28.8	7.8	14 21.3	7.2	59.2
	11	E	348 47.8	46.1	273 55.6	8.0	14 14.1	7.3	59.2
	12	S	3 47.7	S18 46.7	288 22.6	8.0	S14 06.8	7.4	59.1
	13	D	18 47.6	47.3	302 49.6	8.1	13 59.4	7.4	59.1
	14	A	33 47.5	47.9	317 16.7	8.1	13 52.0	7.6	59.1
	15	Y	48 47.3	·· 48.6	331 43.8	8.3	13 44.4	7.6	59.0
	16		63 47.2	49.2	346 11.1	8.3	13 36.8	7.7	59.0
	17		78 47.1	49.8	0 38.4	8.4	13 29.1	7.7	59.0
	18		93 47.0	S18 50.4	15 05.8	8.5	S13 21.4	7.8	58.9
	19		108 46.9	51.0	29 33.3	8.5	13 13.6	7.9	58.9
	20		123 46.7	51.6	44 00.8	8.7	13 05.7	8.0	58.9
	21		138 46.6	·· 52.3	58 28.5	8.7	12 57.7	8.0	58.8
	22		153 46.5	52.9	72 56.2	8.8	12 49.7	8.1	58.8
	23		168 46.4	53.5	87 24.0	8.8	12 41.6	8.2	58.8
17	00		183 46.3	S18 54.1	101 51.8	9.0	S12 33.4	8.2	58.7
	01		198 46.1	54.7	116 19.8	9.0	12 25.2	8.3	58.7
	02		213 46.0	55.3	130 47.8	9.1	12 16.9	8.3	58.7
	03		228 45.9	·· 56.0	145 15.9	9.1	12 08.6	8.5	58.6
	04		243 45.8	56.6	159 44.0	9.3	12 00.1	8.4	58.6
	05		258 45.7	57.2	174 12.3	9.3	11 51.7	8.6	58.6
	06		273 45.5	S18 57.8	188 40.6	9.4	S11 43.1	8.6	58.5
	07		288 45.4	58.4	203 09.0	9.5	11 34.5	8.6	58.5
	08	T	303 45.3	59.0	217 37.5	9.5	11 25.9	8.7	58.5
	09	H	318 45.2	18 59.6	232 06.0	9.6	11 17.2	8.7	58.4
	10	U	333 45.1	19 00.2	246 34.6	9.7	11 08.5	8.9	58.4
	11	R	348 44.9	00.8	261 03.3	9.7	10 59.6	8.8	58.4
	12	S	3 44.8	S19 01.4	275 32.0	9.9	S10 50.8	8.9	58.3
	13	D	18 44.7	02.1	290 00.9	9.9	10 41.9	9.0	58.3
	14	A	33 44.6	02.7	304 29.8	9.9	10 32.9	9.0	58.3
	15	Y	48 44.4	·· 03.3	318 58.7	10.1	10 23.9	9.0	58.2
	16		63 44.3	03.9	333 27.8	10.1	10 14.9	9.2	58.2
	17		78 44.2	04.5	347 56.9	10.2	10 05.7	9.1	58.2
	18		93 44.1	S19 05.1	2 26.1	10.2	S 9 56.6	9.2	58.1
	19		108 43.9	05.7	16 55.3	10.3	9 47.4	9.2	58.1
	20		123 43.8	06.3	31 24.6	10.4	9 38.2	9.3	58.1
	21		138 43.7	·· 06.9	45 54.0	10.4	9 28.9	9.3	58.0
	22		153 43.5	07.5	60 23.4	10.6	9 19.6	9.4	58.0
	23		168 43.4	08.1	74 53.0	10.5	9 10.2	9.4	58.0
			S.D. 16.2	*d* 0.6	S.D. 16.3		16.1		15.9

Lat.	Twilight		Sunrise	Moonrise			
	Naut.	Civil		15	16	17	18
°	h m	h m	h m	h m	h m	h m	h m
N 72	07 03	08 38	11 25	14 23	14 12	14 04	13 58
N 70	06 52	08 15	09 55	13 37	13 44	13 47	13 48
68	06 43	07 57	09 17	13 06	13 23	13 33	13 40
66	06 36	07 42	08 50	12 44	13 07	13 22	13 33
64	06 30	07 30	08 30	12 26	12 53	13 13	13 28
62	06 24	07 20	08 14	12 11	12 42	13 05	13 23
60	06 19	07 11	08 00	11 58	12 32	12 58	13 18
N 58	06 14	07 03	07 48	11 47	12 23	12 51	13 15
56	06 10	06 56	07 38	11 38	12 16	12 46	13 11
54	06 06	06 50	07 29	11 30	12 09	12 41	13 08
52	06 02	06 44	07 21	11 22	12 03	12 36	13 05
50	05 59	06 38	07 14	11 15	11 57	12 32	13 03
45	05 51	06 27	06 59	11 01	11 45	12 23	12 57
N 40	05 44	06 17	06 46	10 49	11 35	12 16	12 52
35	05 38	06 08	06 35	10 38	11 27	12 10	12 48
30	05 31	06 00	06 26	10 29	11 19	12 04	12 45
20	05 19	05 46	06 09	10 14	11 06	11 54	12 39
N 10	05 07	05 33	05 55	10 00	10 55	11 46	12 33
0	04 54	05 19	05 41	09 48	10 44	11 38	12 28
S 10	04 39	05 05	05 27	09 35	10 34	11 30	12 23
20	04 21	04 49	05 13	09 21	10 22	11 21	12 17
30	03 58	04 29	04 56	09 06	10 09	11 11	12 11
35	03 43	04 17	04 45	08 57	10 02	11 05	12 07
40	03 26	04 03	04 34	08 46	09 53	10 59	12 03
45	03 03	03 46	04 20	08 34	09 43	10 51	11 59
S 50	02 32	03 24	04 04	08 20	09 31	10 42	11 53
52	02 16	03 14	03 56	08 13	09 25	10 38	11 50
54	01 57	03 02	03 47	08 05	09 19	10 33	11 47
56	01 32	02 47	03 37	07 57	09 12	10 28	11 44
58	00 54	02 31	03 26	07 47	09 04	10 23	11 41
S 60	////	02 10	03 12	07 36	08 55	10 16	11 37

Lat.	Sunset	Twilight		Moonset			
		Civil	Naut.	15	16	17	18
°	h m	h m	h m	h m	h m	h m	h m
N 72	12 03	14 50	16 26	17 50	19 58	21 55	23 43
N 70	13 33	15 14	16 36	18 36	20 24	22 10	23 51
68	14 12	15 32	16 45	19 05	20 44	22 22	23 57
66	14 38	15 46	16 53	19 28	21 00	22 32	24 03
64	14 59	15 59	16 59	19 45	21 13	22 41	24 07
62	15 15	16 09	17 05	19 59	21 23	22 48	24 11
60	15 29	16 18	17 10	20 12	21 33	22 54	24 14
N 58	15 41	16 26	17 15	20 22	21 41	22 59	24 17
56	15 51	16 33	17 19	20 31	21 48	23 04	24 20
54	16 00	16 39	17 23	20 39	21 54	23 09	24 22
52	16 08	16 45	17 27	20 46	21 59	23 12	24 24
50	16 15	16 51	17 30	20 53	22 05	23 16	24 26
45	16 30	17 02	17 38	21 07	22 15	23 24	24 30
N 40	16 43	17 12	17 45	21 18	22 24	23 30	24 34
35	16 54	17 21	17 52	21 28	22 32	23 35	24 36
30	17 04	17 29	17 58	21 36	22 39	23 40	24 39
20	17 20	17 43	18 10	21 51	22 51	23 48	24 44
N 10	17 35	17 57	18 22	22 03	23 01	23 55	24 47
0	17 48	18 10	18 36	22 15	23 10	24 02	00 02
S 10	18 02	18 25	18 51	22 27	23 20	24 09	00 09
20	18 17	18 41	19 09	22 39	23 30	24 16	00 16
30	18 34	19 01	19 32	22 54	23 41	24 24	00 24
35	18 45	19 13	19 47	23 02	23 47	24 28	00 28
40	18 56	19 27	20 05	23 11	23 55	24 33	00 33
45	19 10	19 44	20 28	23 22	24 03	00 03	00 39
S 50	19 27	20 06	20 59	23 35	24 13	00 13	00 46
52	19 35	20 17	21 15	23 41	24 18	00 18	00 49
54	19 44	20 30	21 35	23 48	24 23	00 23	00 53
56	19 54	20 44	22 02	23 55	24 29	00 29	00 57
58	20 05	21 01	22 42	24 04	00 04	00 36	01 01
S 60	20 19	21 22	////	24 13	00 13	00 43	01 06

Day	SUN			MOON			
	Eqn. of Time		Mer. Pass.	Mer. Pass.		Age	Phase
	00ʰ	12ʰ		Upper	Lower		
	m s	m s	h m	h m	h m	d	
15	15 27	15 22	11 45	16 01	03 32	04	◐
16	15 16	15 11	11 45	16 57	04 30	05	
17	15 05	14 59	11 45	17 50	05 24	06	

1977 NOVEMBER 18, 19, 20 (FRI., SAT., SUN.)

G.M.T.	ARIES	VENUS −3.4		MARS +0.1		JUPITER −2.2		SATURN +0.8	
	G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
d h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
18 00	56 55.4	199 05.5	S13 32.1	286 02.3	N20 14.2	321 19.9	N23 00.9	264 20.7	N12 38.0
01	71 57.9	214 04.9	33.1	301 04.0	14.1	336 22.5	00.9	279 23.1	38.0
02	87 00.3	229 04.4	34.2	316 05.7	14.0	351 25.2	00.9	294 25.4	38.0
03	102 02.8	244 03.8	·· 35.2	331 07.5	·· 13.9	6 27.9	·· 00.9	309 27.8	·· 37.9
04	117 05.3	259 03.2	36.3	346 09.2	13.8	21 30.6	00.9	324 30.1	37.9
05	132 07.7	274 02.6	37.3	1 10.9	13.7	36 33.3	00.9	339 32.5	37.9
06	147 10.2	289 02.0	S13 38.3	16 12.7	N20 13.6	51 35.9	N23 00.9	354 34.8	N12 37.8
07	162 12.7	304 01.5	39.4	31 14.4	13.6	66 38.6	01.0	9 37.2	37.8
08	177 15.1	319 00.9	40.4	46 16.2	13.5	81 41.3	01.0	24 39.6	37.8
F 09	192 17.6	334 00.3	·· 41.4	61 17.9	·· 13.4	96 44.0	·· 01.0	39 41.9	·· 37.8
R 10	207 20.0	348 59.7	42.5	76 19.7	13.3	111 46.7	01.0	54 44.3	37.7
I 11	222 22.5	3 59.2	43.5	91 21.4	13.2	126 49.4	01.0	69 46.6	37.7
D 12	237 25.0	18 58.6	S13 44.6	106 23.2	N20 13.1	141 52.0	N23 01.0	84 49.0	N12 37.7
A 13	252 27.4	33 58.0	45.6	121 24.9	13.0	156 54.7	01.0	99 51.4	37.6
Y 14	267 29.9	48 57.4	46.6	136 26.6	12.9	171 57.4	01.0	114 53.7	37.6
15	282 32.4	63 56.8	·· 47.7	151 28.4	·· 12.9	187 00.1	·· 01.0	129 56.1	·· 37.6
16	297 34.8	78 56.2	48.7	166 30.1	12.8	202 02.8	01.1	144 58.4	37.6
17	312 37.3	93 55.7	49.7	181 31.9	12.7	217 05.5	01.1	160 00.8	37.5
18	327 39.8	108 55.1	S13 50.8	196 33.7	N20 12.6	232 08.1	N23 01.1	175 03.2	N12 37.5
19	342 42.2	123 54.5	51.8	211 35.4	12.5	247 10.8	01.1	190 05.5	37.5
20	357 44.7	138 53.9	52.8	226 37.2	12.4	262 13.5	01.1	205 07.9	37.4
21	12 47.2	153 53.3	·· 53.8	241 38.9	·· 12.3	277 16.2	·· 01.1	220 10.3	·· 37.4
22	27 49.6	168 52.7	54.9	256 40.7	12.3	292 18.9	01.1	235 12.6	37.4
23	42 52.1	183 52.1	55.9	271 42.4	12.2	307 21.6	01.1	250 15.0	37.4
19 00	57 54.5	198 51.6	S13 56.9	286 44.2	N20 12.1	322 24.3	N23 01.1	265 17.3	N12 37.3
01	72 57.0	213 51.0	58.0	301 45.9	12.0	337 26.9	01.2	280 19.7	37.3
02	87 59.5	228 50.4	13 59.0	316 47.7	11.9	352 29.6	01.2	295 22.1	37.3
03	103 01.9	243 49.8	14 00.0	331 49.5	·· 11.8	7 32.3	·· 01.2	310 24.4	·· 37.3
04	118 04.4	258 49.2	01.0	346 51.2	11.8	22 35.0	01.2	325 26.8	37.2
05	133 06.9	273 48.6	02.1	1 53.0	11.7	37 37.7	01.2	340 29.2	37.2
06	148 09.3	288 48.0	S14 03.1	16 54.8	N20 11.6	52 40.4	N23 01.2	355 31.5	N12 37.2
07	163 11.8	303 47.4	04.1	31 56.5	11.5	67 43.1	01.2	10 33.9	37.1
S 08	178 14.3	318 46.8	05.1	46 58.3	11.4	82 45.8	01.2	25 36.2	37.1
A 09	193 16.7	333 46.3	·· 06.2	62 00.1	·· 11.3	97 48.5	·· 01.3	40 38.6	·· 37.1
T 10	208 19.2	348 45.7	07.2	77 01.8	11.3	112 51.1	01.3	55 41.0	37.1
U 11	223 21.6	3 45.1	08.2	92 03.6	11.2	127 53.8	01.3	70 43.3	37.0
R 12	238 24.1	18 44.5	S14 09.2	107 05.4	N20 11.1	142 56.5	N23 01.3	85 45.7	N12 37.0
D 13	253 26.6	33 43.9	10.2	122 07.1	11.0	157 59.2	01.3	100 48.1	37.0
A 14	268 29.0	48 43.3	11.3	137 08.9	10.9	173 01.9	01.3	115 50.4	37.0
Y 15	283 31.5	63 42.7	·· 12.3	152 10.7	·· 10.9	188 04.6	·· 01.3	130 52.8	·· 36.9
16	298 34.0	78 42.1	13.3	167 12.4	10.8	203 07.3	01.3	145 55.2	36.9
17	313 36.4	93 41.5	14.3	182 14.2	10.7	218 10.0	01.3	160 57.5	36.9
18	328 38.9	108 40.9	S14 15.3	197 16.0	N20 10.6	233 12.7	N23 01.4	175 59.9	N12 36.8
19	343 41.4	123 40.3	16.4	212 17.8	10.5	248 15.4	01.4	191 02.3	36.8
20	358 43.8	138 39.7	17.4	227 19.5	10.5	263 18.1	01.4	206 04.6	36.8
21	13 46.3	153 39.1	·· 18.4	242 21.3	·· 10.4	278 20.8	·· 01.4	221 07.0	·· 36.8
22	28 48.8	168 38.5	19.4	257 23.1	10.3	293 23.5	01.4	236 09.4	36.7
23	43 51.2	183 37.9	20.4	272 24.9	10.2	308 26.1	01.4	251 11.7	36.7
20 00	58 53.7	198 37.3	S14 21.4	287 26.7	N20 10.1	323 28.8	N23 01.4	266 14.1	N12 36.7
01	73 56.1	213 36.7	22.4	302 28.4	10.1	338 31.5	01.4	281 16.5	36.7
02	88 58.6	228 36.1	23.4	317 30.2	10.0	353 34.2	01.5	296 18.8	36.6
03	104 01.1	243 35.5	·· 24.5	332 32.0	·· 09.9	8 36.9	·· 01.5	311 21.2	·· 36.6
04	119 03.5	258 34.9	25.5	347 33.8	09.8	23 39.6	01.5	326 23.6	36.6
05	134 06.0	273 34.3	26.5	2 35.6	09.8	38 42.3	01.5	341 25.9	36.6
06	149 08.5	288 33.7	S14 27.5	17 37.4	N20 09.7	53 45.0	N23 01.5	356 28.3	N12 36.5
07	164 10.9	303 33.1	28.5	32 39.2	09.6	68 47.7	01.5	11 30.7	36.5
08	179 13.4	318 32.5	29.5	47 40.9	09.5	83 50.4	01.5	26 33.0	36.5
S 09	194 15.9	333 31.9	·· 30.5	62 42.7	·· 09.4	98 53.1	·· 01.5	41 35.4	·· 36.5
U 10	209 18.3	348 31.3	31.5	77 44.5	09.4	113 55.8	01.5	56 37.8	36.4
N 11	224 20.8	3 30.7	32.5	92 46.3	09.3	128 58.5	01.6	71 40.1	36.4
D 12	239 23.3	18 30.1	S14 33.5	107 48.1	N20 09.2	144 01.2	N23 01.6	86 42.5	N12 36.4
A 13	254 25.7	33 29.5	34.5	122 49.9	09.1	159 03.9	01.6	101 44.9	36.4
Y 14	269 28.2	48 28.9	35.5	137 51.7	09.1	174 06.6	01.6	116 47.2	36.3
15	284 30.6	63 28.3	·· 36.6	152 53.5	·· 09.0	189 09.3	·· 01.6	131 49.6	·· 36.3
16	299 33.1	78 27.7	37.6	167 55.3	08.9	204 12.0	01.6	146 52.0	36.3
17	314 35.6	93 27.1	38.6	182 57.1	08.8	219 14.7	01.6	161 54.3	36.3
18	329 38.0	108 26.5	S14 39.6	197 58.9	N20 08.8	234 17.4	N23 01.6	176 56.7	N12 36.2
19	344 40.5	123 25.9	40.6	213 00.7	08.7	249 20.1	01.7	191 59.1	36.2
20	359 43.0	138 25.3	41.6	228 02.5	08.6	264 22.8	01.7	207 01.5	36.2
21	14 45.4	153 24.7	·· 42.6	243 04.3	·· 08.5	279 25.5	·· 01.7	222 03.8	·· 36.2
22	29 47.9	168 24.1	43.6	258 06.1	08.5	294 28.2	01.7	237 06.2	36.1
23	44 50.4	183 23.4	44.6	273 07.9	08.4	309 30.9	01.7	252 08.6	36.1
Mer. Pass.	h m 20 05.1	*v* −0.6	*d* 1.0	*v* 1.8	*d* 0.1	*v* 2.7	*d* 0.0	*v* 2.4	*d* 0.0

STARS

Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 38.3	S40 23.7
Achernar	335 46.3	S57 21.1
Acrux	173 39.7	S62 58.3
Adhara	255 33.3	S28 56.4
Aldebaran	291 19.9	N16 27.9
Alioth	166 44.7	N56 04.6
Alkaid	153 20.5	N49 25.4
Al Na'ir	28 17.4	S47 04.2
Alnilam	276 13.3	S 1 13.0
Alphard	218 22.4	S 8 33.7
Alphecca	126 34.1	N26 47.5
Alpheratz	358 11.1	N28 58.3
Altair	62 34.6	N 8 48.8
Ankaa	353 41.9	S42 25.7
Antares	112 59.6	S26 22.9
Arcturus	146 20.6	N19 17.9
Atria	108 26.0	S68 59.2
Avior	234 28.6	S59 26.1
Bellatrix	279 00.5	N 6 19.8
Betelgeuse	271 30.1	N 7 24.1
Canopus	264 07.6	S52 40.9
Capella	281 13.7	N45 58.5
Deneb	49 49.9	N45 12.5
Denebola	183 01.2	N14 41.7
Diphda	349 22.6	S18 06.5
Dubhe	194 24.8	N61 51.9
Elnath	278 46.2	N28 35.3
Eltanin	90 59.1	N51 29.8
Enif	34 13.5	N 9 46.6
Fomalhaut	15 53.5	S29 44.4
Gacrux	172 31.2	S56 59.1
Gienah	176 20.1	S17 25.0
Hadar	149 26.6	S60 15.8
Hamal	328 30.7	N23 21.6
Kaus Aust.	84 19.7	S34 23.7
Kochab	137 20.3	N74 14.8
Markab	14 05.0	N15 05.4
Menkar	314 42.8	N 4 00.2
Menkent	148 39.6	S36 15.5
Miaplacidus	221 45.0	S69 37.3
Mirfak	309 18.3	N49 47.0
Nunki	76 31.8	S26 19.4
Peacock	54 01.7	S56 48.5
Pollux	244 00.3	N28 04.6
Procyon	245 27.6	N 5 16.9
Rasalhague	96 31.7	N12 34.8
Regulus	208 12.1	N12 04.5
Rigel	281 37.5	S 8 13.6
Rigil Kent.	140 29.0	S60 44.4
Sabik	102 43.7	S15 41.7
Schedar	350 10.7	N56 25.2
Shaula	96 58.7	S37 05.2
Sirius	258 57.1	S16 41.1
Spica	158 59.8	S11 02.6
Suhail	223 12.0	S43 20.4
Vega	80 57.5	N38 46.1
Zuben'ubi	137 35.5	S15 56.9

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	140 57.0	10 45
Mars	228 49.6	4 52
Jupiter	264 29.7	2 30
Saturn	207 22.8	6 18

G.M.T.	SUN G.H.A.	SUN Dec.	MOON G.H.A.	MOON *v*	MOON Dec.	MOON *d*	MOON H.P.
d h	° ′	° ′	° ′	′	° ′	′	′
18 00	183 43.3	S19 08.7	89 22.5	10.7	S 9 00.8	9.4	57.9
01	198 43.2	09.3	103 52.2	10.7	8 51.4	9.5	57.9
02	213 43.0	09.9	118 21.9	10.8	8 41.9	9.5	57.9
03	228 42.9	· · 10.5	132 51.7	10.8	8 32.4	9.5	57.8
04	243 42.8	11.1	147 21.5	10.9	8 22.9	9.6	57.8
05	258 42.6	11.7	161 51.4	11.0	8 13.3	9.6	57.8
06	273 42.5	S19 12.3	176 21.4	11.0	S 8 03.7	9.7	57.8
07	288 42.4	12.9	190 51.4	11.1	7 54.0	9.7	57.7
08	303 42.3	13.5	205 21.5	11.1	7 44.3	9.7	57.7
F 09	318 42.1	· · 14.1	219 51.6	11.2	7 34.6	9.7	57.7
R 10	333 42.0	14.7	234 21.8	11.3	7 24.9	9.8	57.6
I 11	348 41.9	15.3	248 52.1	11.3	7 15.1	9.8	57.6
D 12	3 41.7	S19 15.9	263 22.4	11.3	S 7 05.3	9.8	57.6
A 13	18 41.6	16.5	277 52.7	11.5	6 55.5	9.8	57.5
Y 14	33 41.5	17.1	292 23.2	11.5	6 45.7	9.9	57.5
15	48 41.3	· · 17.6	306 53.7	11.5	6 35.8	9.9	57.5
16	63 41.2	18.2	321 24.2	11.6	6 25.9	9.9	57.4
17	78 41.1	18.8	335 54.8	11.6	6 16.0	9.9	57.4
18	93 40.9	S19 19.4	350 25.4	11.7	S 6 06.1	10.0	57.4
19	108 40.8	20.0	4 56.1	11.8	5 56.1	9.9	57.3
20	123 40.7	20.6	19 26.9	11.8	5 46.2	10.0	57.3
21	138 40.5	· · 21.2	33 57.7	11.9	5 36.2	10.1	57.3
22	153 40.4	21.8	48 28.6	11.9	5 26.1	10.0	57.3
23	168 40.2	22.4	62 59.5	11.9	5 16.1	10.0	57.2
19 00	183 40.1	S19 23.0	77 30.4	12.0	S 5 06.1	10.1	57.2
01	198 40.0	23.5	92 01.4	12.1	4 56.0	10.1	57.2
02	213 39.8	24.1	106 32.5	12.1	4 45.9	10.1	57.1
03	228 39.7	· · 24.7	121 03.6	12.1	4 35.8	10.1	57.1
04	243 39.6	25.3	135 34.7	12.2	4 25.7	10.1	57.1
05	258 39.4	25.9	150 05.9	12.2	4 15.6	10.1	57.0
06	273 39.3	S19 26.5	164 37.1	12.3	S 4 05.5	10.1	57.0
07	288 39.1	27.0	179 08.4	12.3	3 55.4	10.2	57.0
S 08	303 39.0	27.6	193 39.7	12.4	3 45.2	10.1	57.0
A 09	318 38.9	· · 28.2	208 11.1	12.4	3 35.1	10.2	56.9
T 10	333 38.7	28.8	222 42.5	12.4	3 24.9	10.2	56.9
U 11	348 38.6	29.4	237 13.9	12.5	3 14.7	10.1	56.9
R 12	3 38.4	S19 29.9	251 45.4	12.5	S 3 04.6	10.2	56.8
D 13	18 38.3	30.5	266 16.9	12.6	2 54.4	10.2	56.8
A 14	33 38.2	31.1	280 48.5	12.6	2 44.2	10.2	56.8
Y 15	48 38.0	· · 31.7	295 20.1	12.6	2 34.0	10.2	56.8
16	63 37.9	32.3	309 51.7	12.7	2 23.8	10.2	56.7
17	78 37.7	32.8	324 23.4	12.7	2 13.6	10.2	56.7
18	93 37.6	S19 33.4	338 55.1	12.8	S 2 03.4	10.2	56.7
19	108 37.4	34.0	353 26.9	12.7	1 53.2	10.2	56.6
20	123 37.3	34.6	7 58.6	12.8	1 43.0	10.2	56.6
21	138 37.2	· · 35.1	22 30.4	12.9	1 32.8	10.2	56.6
22	153 37.0	35.7	37 02.3	12.9	1 22.6	10.1	56.6
23	168 36.9	36.3	51 34.2	12.9	1 12.5	10.2	56.5
20 00	183 36.7	S19 36.9	66 06.1	12.9	S 1 02.3	10.2	56.5
01	198 36.6	37.4	80 38.0	13.0	0 52.1	10.2	56.5
02	213 36.4	38.0	95 10.0	13.0	0 41.9	10.2	56.5
03	228 36.3	· · 38.6	109 42.0	13.0	0 31.7	10.1	56.4
04	243 36.1	39.1	124 14.0	13.0	0 21.6	10.2	56.4
05	258 36.0	39.7	138 46.0	13.1	0 11.4	10.1	56.4
06	273 35.8	S19 40.3	153 18.1	13.1	S 0 01.3	10.2	56.4
07	288 35.7	40.8	167 50.2	13.1	N 0 08.9	10.1	56.3
08	303 35.6	41.4	182 22.3	13.2	0 19.0	10.1	56.3
S 09	318 35.4	· · 42.0	196 54.5	13.2	0 29.1	10.2	56.3
U 10	333 35.3	42.5	211 26.7	13.2	0 39.3	10.1	56.2
N 11	348 35.1	43.1	225 58.9	13.2	0 49.4	10.1	56.2
D 12	3 35.0	S19 43.7	240 31.1	13.2	N 0 59.5	10.0	56.2
A 13	18 34.8	44.2	255 03.3	13.3	1 09.5	10.1	56.2
Y 14	33 34.7	44.8	269 35.6	13.3	1 19.6	10.0	56.1
15	48 34.5	· · 45.4	284 07.9	13.3	1 29.6	10.1	56.1
16	63 34.4	45.9	298 40.2	13.3	1 39.7	10.0	56.1
17	78 34.2	46.5	313 12.5	13.4	1 49.7	10.0	56.1
18	93 34.1	S19 47.0	327 44.9	13.3	N 1 59.7	10.0	56.1
19	108 33.9	47.6	342 17.2	13.4	2 09.7	10.0	56.0
20	123 33.8	48.2	356 49.6	13.4	2 19.7	9.9	56.0
21	138 33.6	· · 48.7	11 22.0	13.4	2 29.6	10.0	56.0
22	153 33.4	49.3	25 54.4	13.4	2 39.6	9.9	56.0
23	168 33.3	49.8	40 26.8	13.5	2 49.5	9.9	55.9
	S.D. 16.2	*d* 0.6	S.D. 15.7		15.5		15.3

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 18	Moonrise 19	Moonrise 20	Moonrise 21
°	h m	h m	h m	h m	h m	h m	h m
N 72	07 13	08 53	■	13 58	13 52	13 47	13 41
N 70	07 01	08 27	10 17	13 48	13 48	13 48	13 48
68	06 52	08 07	09 31	13 40	13 45	13 50	13 54
66	06 44	07 51	09 02	13 33	13 43	13 51	13 59
64	06 36	07 38	08 40	13 28	13 40	13 52	14 03
62	06 30	07 27	08 22	13 23	13 38	13 53	14 07
60	06 25	07 17	08 08	13 18	13 36	13 53	14 10
N 58	06 20	07 09	07 55	13 15	13 35	13 54	14 13
56	06 15	07 01	07 44	13 11	13 34	13 54	14 15
54	06 11	06 55	07 35	13 08	13 32	13 55	14 18
52	06 07	06 48	07 27	13 05	13 31	13 55	14 20
50	06 03	06 43	07 19	13 03	13 30	13 56	14 22
45	05 55	06 31	07 03	12 57	13 28	13 57	14 26
N 40	05 47	06 20	06 50	12 52	13 26	13 58	14 29
35	05 40	06 11	06 38	12 48	13 24	13 58	14 32
30	05 34	06 03	06 28	12 45	13 23	13 59	14 35
20	05 21	05 48	06 11	12 39	13 20	14 00	14 40
N 10	05 08	05 34	05 56	12 33	13 18	14 01	14 44
0	04 54	05 20	05 42	12 28	13 16	14 02	14 48
S 10	04 39	05 05	05 28	12 23	13 14	14 03	14 52
20	04 20	04 48	05 12	12 17	13 12	14 04	14 56
30	03 56	04 28	04 54	12 11	13 09	14 05	15 01
35	03 41	04 15	04 44	12 07	13 08	14 06	15 03
40	03 23	04 01	04 32	12 03	13 06	14 07	15 07
45	02 59	03 43	04 17	11 59	13 04	14 08	15 10
S 50	02 27	03 20	04 00	11 53	13 02	14 09	15 15
52	02 09	03 09	03 52	11 50	13 01	14 10	15 17
54	01 48	02 56	03 42	11 47	13 00	14 10	15 19
56	01 20	02 41	03 32	11 44	12 58	14 11	15 22
58	00 32	02 23	03 20	11 41	12 57	14 12	15 24
S 60	////	02 00	03 06	11 37	12 55	14 12	15 28

Lat.	Sunset	Twilight Civil	Twilight Naut.	Moonset 18	Moonset 19	Moonset 20	Moonset 21
°	h m	h m	h m	h m	h m	h m	h m
N 72	■	14 37	16 17	23 43	25 27	01 27	03 08
N 70	13 13	15 03	16 28	23 51	25 28	01 28	03 03
68	13 59	15 23	16 38	23 57	25 29	01 29	02 59
66	14 28	15 39	16 46	24 03	00 03	01 30	02 56
64	14 50	15 52	16 54	24 07	00 07	01 31	02 53
62	15 08	16 03	17 00	24 11	00 11	01 32	02 50
60	15 23	16 13	17 05	24 14	00 14	01 32	02 48
N 58	15 35	16 21	17 11	24 17	00 17	01 33	02 46
56	15 46	16 29	17 15	24 20	00 20	01 33	02 45
54	15 55	16 36	17 19	24 22	00 22	01 33	02 43
52	16 04	16 42	17 23	24 24	00 24	01 34	02 42
50	16 11	16 47	17 27	24 26	00 26	01 34	02 41
45	16 28	17 00	17 36	24 30	00 30	01 35	02 38
N 40	16 41	17 10	17 43	24 34	00 34	01 35	02 36
35	16 52	17 19	17 50	24 36	00 36	01 36	02 34
30	17 02	17 28	17 57	24 39	00 39	01 36	02 32
20	17 20	17 43	18 10	24 44	00 44	01 37	02 29
N 10	17 35	17 57	18 23	24 47	00 47	01 38	02 26
0	17 49	18 11	18 36	00 02	00 51	01 38	02 24
S 10	18 03	18 26	18 52	00 09	00 55	01 39	02 22
20	18 19	18 43	19 11	00 16	00 59	01 39	02 19
30	18 37	19 03	19 35	00 24	01 03	01 40	02 16
35	18 48	19 16	19 50	00 28	01 05	01 40	02 14
40	19 00	19 31	20 09	00 33	01 08	01 41	02 12
45	19 14	19 49	20 33	00 39	01 11	01 41	02 10
S 50	19 32	20 12	21 06	00 46	01 15	01 42	02 07
52	19 40	20 23	21 23	00 49	01 17	01 42	02 06
54	19 50	20 36	21 45	00 53	01 19	01 42	02 05
56	20 00	20 52	22 15	00 57	01 21	01 42	02 03
58	20 13	21 10	23 08	01 01	01 23	01 43	02 02
S 60	20 27	21 33	////	01 06	01 26	01 43	02 00

Day	SUN Eqn. of Time 00ʰ	SUN Eqn. of Time 12ʰ	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
	m s	m s	h m	h m	h m	d	
18	14 53	14 47	11 45	18 40	06 15	07	◐
19	14 41	14 34	11 45	19 27	07 04	08	
20	14 27	14 20	11 46	20 13	07 50	09	

1977 NOVEMBER 21, 22, 23 (MON., TUES., WED.)

G.M.T.		ARIES	VENUS −3.4		MARS +0.1		JUPITER −2.2		SATURN +0.8	
		G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
d	h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
21	00	59 52.8	198 22.8	S14 45.6	288 09.7	N20 08.3	324 33.6	N23 01.7	267 10.9	N12 36.1
	01	74 55.3	213 22.2	46.6	303 11.5	08.3	339 36.3	01.7	282 13.3	36.1
	02	89 57.7	228 21.6	47.6	318 13.3	08.2	354 39.0	01.7	297 15.7	36.0
	03	105 00.2	243 21.0	·· 48.6	333 15.1	·· 08.1	9 41.7	·· 01.8	312 18.1	·· 36.0
	04	120 02.7	258 20.4	49.5	348 16.9	08.0	24 44.4	01.8	327 20.4	36.0
	05	135 05.1	273 19.8	50.5	3 18.7	08.0	39 47.1	01.8	342 22.8	36.0
	06	150 07.6	288 19.2	S14 51.5	18 20.5	N20 07.9	54 49.8	N23 01.8	357 25.2	N12 35.9
	07	165 10.1	303 18.6	52.5	33 22.4	07.8	69 52.5	01.8	12 27.5	35.9
	08	180 12.5	318 17.9	53.5	48 24.2	07.8	84 55.2	01.8	27 29.9	35.9
M	09	195 15.0	333 17.3	·· 54.5	63 26.0	·· 07.7	99 57.9	·· 01.8	42 32.3	·· 35.9
O	10	210 17.5	348 16.7	55.5	78 27.8	07.6	115 00.6	01.8	57 34.7	35.8
N	11	225 19.9	3 16.1	56.5	93 29.6	07.5	130 03.3	01.8	72 37.0	35.8
D	12	240 22.4	18 15.5	S14 57.5	108 31.4	N20 07.5	145 06.1	N23 01.9	87 39.4	N12 35.8
A	13	255 24.9	33 14.9	58.5	123 33.2	07.4	160 08.8	01.9	102 41.8	35.8
Y	14	270 27.3	48 14.2	14 59.5	138 35.1	07.3	175 11.5	01.9	117 44.1	35.7
	15	285 29.8	63 13.6	15 00.5	153 36.9	·· 07.3	190 14.2	·· 01.9	132 46.5	·· 35.7
	16	300 32.2	78 13.0	01.4	168 38.7	07.2	205 16.9	01.9	147 48.9	35.7
	17	315 34.7	93 12.4	02.4	183 40.5	07.1	220 19.6	01.9	162 51.3	35.7
	18	330 37.2	108 11.8	S15 03.4	198 42.3	N20 07.1	235 22.3	N23 01.9	177 53.6	N12 35.6
	19	345 39.6	123 11.2	04.4	213 44.2	07.0	250 25.0	01.9	192 56.0	35.6
	20	0 42.1	138 10.5	05.4	228 46.0	06.9	265 27.7	02.0	207 58.4	35.6
	21	15 44.6	153 09.9	·· 06.4	243 47.8	·· 06.9	280 30.4	·· 02.0	223 00.8	·· 35.6
	22	30 47.0	168 09.3	07.4	258 49.6	06.8	295 33.1	02.0	238 03.1	35.6
	23	45 49.5	183 08.7	08.3	273 51.5	06.7	310 35.8	02.0	253 05.5	35.5
22	00	60 52.0	198 08.1	S15 09.3	288 53.3	N20 06.7	325 38.5	N23 02.0	268 07.9	N12 35.5
	01	75 54.4	213 07.4	10.3	303 55.1	06.6	340 41.3	02.0	283 10.3	35.5
	02	90 56.9	228 06.8	11.3	318 56.9	06.5	355 44.0	02.0	298 12.6	35.5
	03	105 59.4	243 06.2	·· 12.3	333 58.8	·· 06.5	10 46.7	·· 02.0	313 15.0	·· 35.4
	04	121 01.8	258 05.6	13.3	349 00.6	06.4	25 49.4	02.1	328 17.4	35.4
	05	136 04.3	273 04.9	14.2	4 02.4	06.3	40 52.1	02.1	343 19.8	35.4
	06	151 06.7	288 04.3	S15 15.2	19 04.3	N20 06.3	55 54.8	N23 02.1	358 22.1	N12 35.4
	07	166 09.2	303 03.7	16.2	34 06.1	06.2	70 57.5	02.1	13 24.5	35.3
	08	181 11.7	318 03.1	17.2	49 07.9	06.1	86 00.2	02.1	28 26.9	35.3
T	09	196 14.1	333 02.4	·· 18.1	64 09.8	·· 06.1	101 02.9	·· 02.1	43 29.3	·· 35.3
U	10	211 16.6	348 01.8	19.1	79 11.6	06.0	116 05.7	02.1	58 31.6	35.3
E	11	226 19.1	3 01.2	20.1	94 13.5	06.0	131 08.4	02.1	73 34.0	35.3
S	12	241 21.5	18 00.6	S15 21.1	109 15.3	N20 05.9	146 11.1	N23 02.2	88 36.4	N12 35.2
D	13	256 24.0	32 59.9	22.0	124 17.1	05.8	161 13.8	02.2	103 38.8	35.2
A	14	271 26.5	47 59.3	23.0	139 19.0	05.8	176 16.5	02.2	118 41.2	35.2
Y	15	286 28.9	62 58.7	·· 24.0	154 20.8	·· 05.7	191 19.2	·· 02.2	133 43.5	·· 35.2
	16	301 31.4	77 58.0	25.0	169 22.7	05.6	206 21.9	02.2	148 45.9	35.1
	17	316 33.8	92 57.4	25.9	184 24.5	05.6	221 24.7	02.2	163 48.3	35.1
	18	331 36.3	107 56.8	S15 26.9	199 26.4	N20 05.5	236 27.4	N23 02.2	178 50.7	N12 35.1
	19	346 38.8	122 56.1	27.9	214 28.2	05.5	251 30.1	02.2	193 53.0	35.1
	20	1 41.2	137 55.5	28.8	229 30.1	05.4	266 32.8	02.3	208 55.4	35.1
	21	16 43.7	152 54.9	·· 29.8	244 31.9	·· 05.3	281 35.5	·· 02.3	223 57.8	·· 35.0
	22	31 46.2	167 54.3	30.8	259 33.8	05.3	296 38.2	02.3	239 00.2	35.0
	23	46 48.6	182 53.6	31.7	274 35.6	05.2	311 40.9	02.3	254 02.6	35.0
23	00	61 51.1	197 53.0	S15 32.7	289 37.5	N20 05.2	326 43.7	N23 02.3	269 04.9	N12 35.0
	01	76 53.6	212 52.4	33.7	304 39.3	05.1	341 46.4	02.3	284 07.3	34.9
	02	91 56.0	227 51.7	34.6	319 41.2	05.0	356 49.1	02.3	299 09.7	34.9
	03	106 58.5	242 51.1	·· 35.6	334 43.0	·· 05.0	11 51.8	·· 02.3	314 12.1	·· 34.9
	04	122 01.0	257 50.4	36.6	349 44.9	04.9	26 54.5	02.4	329 14.5	34.9
	05	137 03.4	272 49.8	37.5	4 46.7	04.9	41 57.2	02.4	344 16.8	34.9
	06	152 05.9	287 49.2	S15 38.5	19 48.6	N20 04.8	57 00.0	N23 02.4	359 19.2	N12 34.8
W	07	167 08.3	302 48.5	39.5	34 50.4	04.7	72 02.7	02.4	14 21.6	34.8
E	08	182 10.8	317 47.9	40.4	49 52.3	04.7	87 05.4	02.4	29 24.0	34.8
D	09	197 13.3	332 47.3	·· 41.4	64 54.2	·· 04.6	102 08.1	·· 02.4	44 26.4	·· 34.8
N	10	212 15.7	347 46.6	42.3	79 56.0	04.6	117 10.8	02.4	59 28.7	34.8
E	11	227 18.2	2 46.0	43.3	94 57.9	04.5	132 13.6	02.4	74 31.1	34.7
S	12	242 20.7	17 45.3	S15 44.3	109 59.8	N20 04.5	147 16.3	N23 02.4	89 33.5	N12 34.7
D	13	257 23.1	32 44.7	45.2	125 01.6	04.4	162 19.0	02.5	104 35.9	34.7
A	14	272 25.6	47 44.1	46.2	140 03.5	04.3	177 21.7	02.5	119 38.3	34.7
Y	15	287 28.1	62 43.4	·· 47.1	155 05.4	·· 04.3	192 24.4	·· 02.5	134 40.6	·· 34.7
	16	302 30.5	77 42.8	48.1	170 07.2	04.2	207 27.2	02.5	149 43.0	34.6
	17	317 33.0	92 42.1	49.0	185 09.1	04.2	222 29.9	02.5	164 45.4	34.6
	18	332 35.5	107 41.5	S15 50.0	200 11.0	N20 04.1	237 32.6	N23 02.5	179 47.8	N12 34.6
	19	347 37.9	122 40.9	50.9	215 12.8	04.1	252 35.3	02.5	194 50.2	34.6
	20	2 40.4	137 40.2	51.9	230 14.7	04.0	267 38.1	02.5	209 52.6	34.6
	21	17 42.8	152 39.6	·· 52.8	245 16.6	·· 04.0	282 40.8	·· 02.6	224 54.9	·· 34.5
	22	32 45.3	167 38.9	53.8	260 18.5	03.9	297 43.5	02.6	239 57.3	34.5
	23	47 47.8	182 38.3	54.7	275 20.3	03.9	312 46.2	02.6	254 59.7	34.5
Mer. Pass.		h m 19 53.3	*v* −0.6	*d* 1.0	*v* 1.8	*d* 0.1	*v* 2.7	*d* 0.0	*v* 2.4	*d* 0.0

STARS		
Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 38.3	S40 23.7
Achernar	335 46.3	S57 21.1
Acrux	173 39.6	S62 58.3
Adhara	255 33.3	S28 56.5
Aldebaran	291 19.8	N16 27.9
Alioth	166 44.7	N56 04.6
Alkaid	153 20.5	N49 25.3
Al Na'ir	28 17.4	S47 04.2
Alnilam	276 13.3	S 1 13.0
Alphard	218 22.4	S 8 33.7
Alphecca	126 34.1	N26 47.5
Alpheratz	358 11.1	N28 58.3
Altair	62 34.6	N 8 48.8
Ankaa	353 41.9	S42 25.7
Antares	112 59.6	S26 22.9
Arcturus	146 20.5	N19 17.9
Atria	108 26.0	S68 59.2
Avior	234 28.6	S59 26.1
Bellatrix	279 00.5	N 6 19.7
Betelgeuse	271 30.0	N 7 24.1
Canopus	264 07.6	S52 41.0
Capella	281 13.7	N45 58.5
Deneb	49 49.9	N45 12.4
Denebola	183 01.2	N14 41.7
Diphda	349 22.6	S18 06.5
Dubhe	194 24.8	N61 51.9
Elnath	278 46.2	N28 35.3
Eltanin	90 59.1	N51 29.8
Enif	34 13.5	N 9 46.6
Fomalhaut	15 53.5	S29 44.4
Gacrux	172 31.1	S56 59.1
Gienah	176 20.1	S17 25.0
Hadar	149 26.5	S60 15.8
Hamal	328 30.7	N23 21.6
Kaus Aust.	84 19.7	S34 23.7
Kochab	137 20.3	N74 14.8
Markab	14 05.0	N15 05.4
Menkar	314 42.8	N 4 00.2
Menkent	148 39.6	S36 15.5
Miaplacidus	221 45.0	S69 37.3
Mirfak	309 18.3	N49 47.0
Nunki	76 31.8	S26 19.4
Peacock	54 01.7	S56 48.5
Pollux	244 00.3	N28 04.6
Procyon	245 27.6	N 5 16.9
Rasalhague	96 31.7	N12 34.8
Regulus	208 12.1	N12 04.5
Rigel	281 37.5	S 8 13.6
Rigil Kent.	140 29.0	S60 44.4
Sabik	102 43.7	S15 41.7
Schedar	350 10.7	N56 25.2
Shaula	96 58.8	S37 05.2
Sirius	258 57.1	S16 41.2
Spica	158 59.8	S11 02.6
Suhail	223 12.0	S43 20.4
Vega	80 57.5	N38 46.1
Zuben'ubi	137 35.5	S15 56.9

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	137 16.1	10 48
Mars	228 01.3	4 44
Jupiter	264 46.6	2 17
Saturn	207 15.9	6 07

G.M.T.		SUN G.H.A.	SUN Dec.	MOON G.H.A.	v	MOON Dec.	d	H.P.
d	h	° ′	° ′	° ′	′	° ′	′	′
21	00	183 33.1	S19 50.4	54 59.3	13.4	N 2 59.4	9.8	55.9
	01	198 33.0	51.0	69 31.7	13.5	3 09.2	9.9	55.9
	02	213 32.8	51.5	84 04.2	13.5	3 19.1	9.8	55.9
	03	228 32.7	· · 52.1	98 36.7	13.5	3 28.9	9.8	55.8
	04	243 32.5	52.6	113 09.2	13.5	3 38.7	9.8	55.8
	05	258 32.4	53.2	127 41.7	13.5	3 48.5	9.8	55.8
	06	273 32.2	S19 53.7	142 14.2	13.5	N 3 58.3	9.7	55.8
	07	288 32.1	54.3	156 46.7	13.5	4 08.0	9.7	55.7
	08	303 31.9	54.8	171 19.2	13.6	4 17.7	9.7	55.7
M	09	318 31.7	· · 55.4	185 51.8	13.5	4 27.4	9.6	55.7
O	10	333 31.6	55.9	200 24.3	13.5	4 37.0	9.7	55.7
N	11	348 31.4	56.5	214 56.8	13.6	4 46.7	9.6	55.7
D	12	3 31.3	S19 57.0	229 29.4	13.6	N 4 56.3	9.5	55.6
A	13	18 31.1	57.6	244 02.0	13.5	5 05.8	9.6	55.6
Y	14	33 31.0	58.1	258 34.5	13.6	5 15.4	9.5	55.6
	15	48 30.8	· · 58.7	273 07.1	13.6	5 24.9	9.5	55.6
	16	63 30.6	59.2	287 39.7	13.6	5 34.4	9.4	55.6
	17	78 30.5	19 59.8	302 12.3	13.6	5 43.8	9.4	55.5
	18	93 30.3	S20 00.3	316 44.9	13.6	N 5 53.2	9.4	55.5
	19	108 30.2	00.9	331 17.5	13.6	6 02.6	9.4	55.5
	20	123 30.0	01.4	345 50.1	13.6	6 12.0	9.3	55.5
	21	138 29.8	· · 02.0	0 22.7	13.6	6 21.3	9.3	55.5
	22	153 29.7	02.5	14 55.3	13.6	6 30.6	9.2	55.4
	23	168 29.5	03.0	29 27.9	13.6	6 39.8	9.2	55.4
22	00	183 29.4	S20 03.6	44 00.5	13.6	N 6 49.0	9.2	55.4
	01	198 29.2	04.1	58 33.1	13.6	6 58.2	9.2	55.4
	02	213 29.0	04.7	73 05.7	13.5	7 07.4	9.1	55.4
	03	228 28.9	· · 05.2	87 38.2	13.6	7 16.5	9.0	55.3
	04	243 28.7	05.7	102 10.8	13.6	7 25.5	9.1	55.3
	05	258 28.5	06.3	116 43.4	13.6	7 34.6	9.0	55.3
	06	273 28.4	S20 06.8	131 16.0	13.6	N 7 43.6	8.9	55.3
	07	288 28.2	07.4	145 48.6	13.6	7 52.5	8.9	55.3
	08	303 28.1	07.9	160 21.2	13.6	8 01.4	8.9	55.2
T	09	318 27.9	· · 08.4	174 53.8	13.5	8 10.3	8.8	55.2
U	10	333 27.7	09.0	189 26.3	13.6	8 19.1	8.8	55.2
E	11	348 27.6	09.5	203 58.9	13.6	8 27.9	8.7	55.2
S	12	3 27.4	S20 10.0	218 31.5	13.5	N 8 36.6	8.7	55.2
D	13	18 27.2	10.6	233 04.0	13.6	8 45.3	8.7	55.1
A	14	33 27.1	11.1	247 36.6	13.5	8 54.0	8.6	55.1
Y	15	48 26.9	· · 11.6	262 09.1	13.6	9 02.6	8.6	55.1
	16	63 26.7	12.2	276 41.7	13.5	9 11.2	8.5	55.1
	17	78 26.6	12.7	291 14.2	13.5	9 19.7	8.5	55.1
	18	93 26.4	S20 13.2	305 46.7	13.5	N 9 28.2	8.4	55.1
	19	108 26.2	13.8	320 19.2	13.5	9 36.6	8.4	55.0
	20	123 26.1	14.3	334 51.7	13.5	9 45.0	8.3	55.0
	21	138 25.9	· · 14.8	349 24.2	13.5	9 53.3	8.3	55.0
	22	153 25.7	15.3	3 56.7	13.5	10 01.6	8.2	55.0
	23	168 25.6	15.9	18 29.2	13.5	10 09.8	8.2	55.0
23	00	183 25.4	S20 16.4	33 01.7	13.4	N10 18.0	8.1	55.0
	01	198 25.2	16.9	47 34.1	13.5	10 26.1	8.1	54.9
	02	213 25.0	17.4	62 06.6	13.4	10 34.2	8.1	54.9
	03	228 24.9	· · 18.0	76 39.0	13.4	10 42.3	7.9	54.9
	04	243 24.7	18.5	91 11.4	13.5	10 50.2	8.0	54.9
	05	258 24.5	19.0	105 43.9	13.4	10 58.2	7.8	54.9
	06	273 24.4	S20 19.5	120 16.3	13.3	N11 06.0	7.9	54.9
W	07	288 24.2	20.1	134 48.6	13.4	11 13.9	7.7	54.8
E	08	303 24.0	20.6	149 21.0	13.4	11 21.6	7.7	54.8
D	09	318 23.8	· · 21.1	163 53.4	13.3	11 29.3	7.7	54.8
N	10	333 23.7	21.6	178 25.7	13.4	11 37.0	7.6	54.8
E	11	348 23.5	22.1	192 58.1	13.3	11 44.6	7.6	54.8
S	12	3 23.3	S20 22.7	207 30.4	13.3	N11 52.2	7.5	54.8
D	13	18 23.1	23.2	222 02.7	13.3	11 59.7	7.4	54.8
A	14	33 23.0	23.7	236 35.0	13.3	12 07.1	7.4	54.7
Y	15	48 22.8	· · 24.2	251 07.3	13.3	12 14.5	7.3	54.7
	16	63 22.6	24.7	265 39.6	13.2	12 21.8	7.3	54.7
	17	78 22.4	25.2	280 11.8	13.3	12 29.1	7.2	54.7
	18	93 22.3	S20 25.8	294 44.1	13.2	N12 36.3	7.1	54.7
	19	108 22.1	26.3	309 16.3	13.2	12 43.4	7.1	54.7
	20	123 21.9	26.8	323 48.5	13.2	12 50.5	7.0	54.7
	21	138 21.7	· · 27.3	338 20.7	13.2	12 57.5	7.0	54.6
	22	153 21.6	27.8	352 52.9	13.2	13 04.5	6.9	54.6
	23	168 21.4	28.3	7 25.1	13.1	13 11.4	6.8	54.6
		S.D. 16.2	d 0.5	S.D. 15.2		15.0		14.9

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 21	Moonrise 22	Moonrise 23	Moonrise 24
°	h m	h m	h m	h m	h m	h m	h m
N 72	07 23	09 07	▬	13 41	13 36	13 30	13 23
N 70	07 10	08 38	10 44	13 48	13 49	13 50	13 54
68	07 00	08 17	09 46	13 54	14 00	14 07	14 17
66	06 51	07 59	09 13	13 59	14 08	14 20	14 34
64	06 43	07 45	08 49	14 03	14 16	14 31	14 49
62	06 36	07 34	08 30	14 07	14 22	14 40	15 01
60	06 30	07 23	08 15	14 10	14 28	14 48	15 12
N 58	06 25	07 15	08 02	14 13	14 33	14 55	15 21
56	06 20	07 07	07 50	14 15	14 37	15 01	15 29
54	06 15	07 00	07 40	14 18	14 41	15 07	15 36
52	06 11	06 53	07 32	14 20	14 45	15 12	15 42
50	06 07	06 47	07 24	14 22	14 48	15 17	15 48
45	05 58	06 34	07 07	14 26	14 55	15 27	16 01
N 40	05 50	06 23	06 53	14 29	15 01	15 35	16 11
35	05 43	06 14	06 41	14 32	15 06	15 42	16 20
30	05 36	06 05	06 31	14 35	15 11	15 48	16 28
20	05 23	05 49	06 13	14 40	15 19	15 59	16 41
N 10	05 09	05 35	05 57	14 44	15 26	16 09	16 53
0	04 55	05 21	05 43	14 48	15 33	16 18	17 04
S 10	04 39	05 05	05 28	14 52	15 40	16 28	17 16
20	04 20	04 48	05 12	14 56	15 47	16 37	17 28
30	03 55	04 27	04 53	15 01	15 55	16 49	17 42
35	03 39	04 14	04 42	15 03	16 00	16 55	17 50
40	03 20	03 59	04 30	15 07	16 05	17 03	17 59
45	02 55	03 40	04 15	15 10	16 11	17 11	18 10
S 50	02 21	03 16	03 57	15 15	16 19	17 22	18 23
52	02 03	03 04	03 48	15 17	16 23	17 27	18 29
54	01 40	02 51	03 38	15 19	16 27	17 32	18 36
56	01 08	02 35	03 27	15 22	16 31	17 38	18 43
58	////	02 15	03 14	15 24	16 36	17 45	18 52
S 60	////	01 51	03 00	15 28	16 41	17 53	19 01

Lat.	Sunset	Twilight Civil	Twilight Naut.	Moonset 21	Moonset 22	Moonset 23	Moonset 24
°	h m	h m	h m	h m	h m	h m	h m
N 72	▬	14 24	16 08	03 08	04 47	06 28	08 10
N 70	12 48	14 53	16 21	03 03	04 36	06 09	07 40
68	13 45	15 15	16 32	02 59	04 27	05 54	07 18
66	14 18	15 32	16 41	02 56	04 19	05 41	07 01
64	14 42	15 46	16 48	02 53	04 13	05 31	06 47
62	15 01	15 58	16 55	02 50	04 07	05 23	06 36
60	15 17	16 08	17 01	02 48	04 03	05 15	06 26
N 58	15 30	16 17	17 07	02 46	03 59	05 09	06 17
56	15 41	16 25	17 12	02 45	03 55	05 03	06 10
54	15 51	16 32	17 16	02 43	03 52	04 58	06 03
52	16 00	16 39	17 21	02 42	03 48	04 54	05 57
50	16 08	16 45	17 25	02 41	03 46	04 49	05 51
45	16 25	16 58	17 34	02 38	03 40	04 40	05 40
N 40	16 39	17 09	17 42	02 36	03 35	04 33	05 30
35	16 51	17 18	17 49	02 34	03 31	04 27	05 22
30	17 01	17 27	17 56	02 32	03 27	04 21	05 14
20	17 19	17 43	18 10	02 29	03 20	04 11	05 02
N 10	17 35	17 57	18 23	02 26	03 15	04 03	04 51
0	17 50	18 12	18 37	02 24	03 09	03 55	04 40
S 10	18 05	18 27	18 54	02 22	03 04	03 47	04 30
20	18 21	18 45	19 13	02 19	02 58	03 38	04 19
30	18 40	19 06	19 38	02 16	02 52	03 29	04 07
35	18 51	19 19	19 54	02 14	02 48	03 23	04 00
40	19 03	19 34	20 13	02 12	02 44	03 17	03 51
45	19 18	19 53	20 38	02 10	02 39	03 09	03 42
S 50	19 37	20 17	21 13	02 07	02 33	03 01	03 31
52	19 45	20 29	21 32	02 06	02 31	02 57	03 25
54	19 55	20 43	21 55	02 05	02 28	02 52	03 19
56	20 06	20 59	22 29	02 03	02 25	02 47	03 13
58	20 19	21 19	////	02 02	02 21	02 42	03 06
S 60	20 34	21 44	////	02 00	02 17	02 36	02 57

Day	SUN Eqn. of Time 00ʰ	SUN Eqn. of Time 12ʰ	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	Age	Phase
	m s	m s	h m	h m	h m	d	
21	14 13	14 05	11 46	20 58	08 36	10	◐
22	13 58	13 50	11 46	21 44	09 21	11	
23	13 42	13 34	11 46	22 29	10 06	12	

1977 NOVEMBER 24, 25, 26 (THURS., FRI., SAT.)

	G.M.T.	ARIES	VENUS −3.4		MARS 0.0		JUPITER −2.2		SATURN +0.8	
		G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
	d h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
	24 00	62 50.2	197 37.6	S15 55.7	290 22.2	N20 03.8	327 48.9	N23 02.6	270 02.1	N12 34.5
	01	77 52.7	212 37.0	56.6	305 24.1	03.7	342 51.7	02.6	285 04.5	34.5
	02	92 55.2	227 36.3	57.6	320 26.0	03.7	357 54.4	02.6	300 06.9	34.4
	03	107 57.6	242 35.7	·· 58.5	335 27.8	·· 03.6	12 57.1	·· 02.6	315 09.2	·· 34.4
	04	123 00.1	257 35.0	15 59.5	350 29.7	03.6	27 59.8	02.6	330 11.6	34.4
	05	138 02.6	272 34.4	16 00.4	5 31.6	03.5	43 02.6	02.7	345 14.0	34.4
	06	153 05.0	287 33.7	S16 01.4	20 33.5	N20 03.5	58 05.3	N23 02.7	0 16.4	N12 34.4
	07	168 07.5	302 33.1	02.3	35 35.4	03.4	73 08.0	02.7	15 18.8	34.3
T	08	183 10.0	317 32.4	03.3	50 37.2	03.4	88 10.7	02.7	30 21.2	34.3
H	09	198 12.4	332 31.8	·· 04.2	65 39.1	·· 03.3	103 13.5	·· 02.7	45 23.6	·· 34.3
U	10	213 14.9	347 31.1	05.2	80 41.0	03.3	118 16.2	02.7	60 25.9	34.3
R	11	228 17.3	2 30.5	06.1	95 42.9	03.2	133 18.9	02.7	75 28.3	34.3
S	12	243 19.8	17 29.8	S16 07.0	110 44.8	N20 03.2	148 21.7	N23 02.7	90 30.7	N12 34.2
D	13	258 22.3	32 29.2	08.0	125 46.7	03.1	163 24.4	02.8	105 33.1	34.2
A	14	273 24.7	47 28.5	08.9	140 48.6	03.1	178 27.1	02.8	120 35.5	34.2
Y	15	288 27.2	62 27.9	·· 09.9	155 50.5	·· 03.0	193 29.8	·· 02.8	135 37.9	·· 34.2
	16	303 29.7	77 27.2	10.8	170 52.4	03.0	208 32.6	02.8	150 40.3	34.2
	17	318 32.1	92 26.6	11.7	185 54.3	02.9	223 35.3	02.8	165 42.6	34.1
	18	333 34.6	107 25.9	S16 12.7	200 56.2	N20 02.9	238 38.0	N23 02.8	180 45.0	N12 34.1
	19	348 37.1	122 25.3	13.6	215 58.0	02.8	253 40.8	02.8	195 47.4	34.1
	20	3 39.5	137 24.6	14.5	230 59.9	02.8	268 43.5	02.8	210 49.8	34.1
	21	18 42.0	152 23.9	·· 15.5	246 01.8	·· 02.7	283 46.2	·· 02.9	225 52.2	·· 34.1
	22	33 44.4	167 23.3	16.4	261 03.7	02.7	298 48.9	02.9	240 54.6	34.1
	23	48 46.9	182 22.6	17.3	276 05.6	02.7	313 51.7	02.9	255 57.0	34.0
	25 00	63 49.4	197 22.0	S16 18.3	291 07.5	N20 02.6	328 54.4	N23 02.9	270 59.3	N12 34.0
	01	78 51.8	212 21.3	19.2	306 09.4	02.6	343 57.1	02.9	286 01.7	34.0
	02	93 54.3	227 20.7	20.1	321 11.4	02.5	358 59.9	02.9	301 04.1	34.0
	03	108 56.8	242 20.0	·· 21.1	336 13.3	·· 02.5	14 02.6	·· 02.9	316 06.5	·· 34.0
	04	123 59.2	257 19.3	22.0	351 15.2	02.4	29 05.3	02.9	331 08.9	33.9
	05	139 01.7	272 18.7	22.9	6 17.1	02.4	44 08.1	03.0	346 11.3	33.9
	06	154 04.2	287 18.0	S16 23.9	21 19.0	N20 02.3	59 10.8	N23 03.0	1 13.7	N12 33.9
	07	169 06.6	302 17.4	24.8	36 20.9	02.3	74 13.5	03.0	16 16.1	33.9
	08	184 09.1	317 16.7	25.7	51 22.8	02.2	89 16.3	03.0	31 18.5	33.9
F	09	199 11.6	332 16.0	·· 26.6	66 24.7	·· 02.2	104 19.0	·· 03.0	46 20.8	·· 33.9
R	10	214 14.0	347 15.4	27.6	81 26.6	02.2	119 21.7	03.0	61 23.2	33.8
I	11	229 16.5	2 14.7	28.5	96 28.5	02.1	134 24.5	03.0	76 25.6	33.8
D	12	244 18.9	17 14.0	S16 29.4	111 30.4	N20 02.1	149 27.2	N23 03.0	91 28.0	N12 33.8
A	13	259 21.4	32 13.4	30.3	126 32.4	02.0	164 29.9	03.1	106 30.4	33.8
Y	14	274 23.9	47 12.7	31.2	141 34.3	02.0	179 32.7	03.1	121 32.8	33.8
	15	289 26.3	62 12.0	·· 32.2	156 36.2	·· 01.9	194 35.4	·· 03.1	136 35.2	·· 33.8
	16	304 28.8	77 11.4	33.1	171 38.1	01.9	209 38.1	03.1	151 37.6	33.7
	17	319 31.3	92 10.7	34.0	186 40.0	01.9	224 40.9	03.1	166 40.0	33.7
	18	334 33.7	107 10.0	S16 34.9	201 41.9	N20 01.8	239 43.6	N23 03.1	181 42.4	N12 33.7
	19	349 36.2	122 09.4	35.8	216 43.9	01.8	254 46.3	03.1	196 44.7	33.7
	20	4 38.7	137 08.7	36.8	231 45.8	01.7	269 49.1	03.2	211 47.1	33.7
	21	19 41.1	152 08.0	·· 37.7	246 47.7	·· 01.7	284 51.8	·· 03.2	226 49.5	·· 33.6
	22	34 43.6	167 07.4	38.6	261 49.6	01.7	299 54.6	03.2	241 51.9	33.6
	23	49 46.1	182 06.7	39.5	276 51.6	01.6	314 57.3	03.2	256 54.3	33.6
	26 00	64 48.5	197 06.0	S16 40.4	291 53.5	N20 01.6	330 00.0	N23 03.2	271 56.7	N12 33.6
	01	79 51.0	212 05.4	41.3	306 55.4	01.5	345 02.8	03.2	286 59.1	33.6
	02	94 53.4	227 04.7	42.2	321 57.3	01.5	0 05.5	03.2	302 01.5	33.6
	03	109 55.9	242 04.0	·· 43.2	336 59.3	·· 01.5	15 08.2	·· 03.2	317 03.9	·· 33.5
	04	124 58.4	257 03.3	44.1	352 01.2	01.4	30 11.0	03.3	332 06.3	33.5
	05	140 00.8	272 02.7	45.0	7 03.1	01.4	45 13.7	03.3	347 08.7	33.5
	06	155 03.3	287 02.0	S16 45.9	22 05.1	N20 01.4	60 16.5	N23 03.3	2 11.1	N12 33.5
	07	170 05.8	302 01.3	46.8	37 07.0	01.3	75 19.2	03.3	17 13.5	33.5
S	08	185 08.2	317 00.6	47.7	52 08.9	01.3	90 21.9	03.3	32 15.8	33.5
A	09	200 10.7	332 00.0	·· 48.6	67 10.9	·· 01.2	105 24.7	·· 03.3	47 18.2	·· 33.5
T	10	215 13.2	346 59.3	49.5	82 12.8	01.2	120 27.4	03.3	62 20.6	33.4
U	11	230 15.6	1 58.6	50.4	97 14.8	01.2	135 30.2	03.3	77 23.0	33.4
R	12	245 18.1	16 57.9	S16 51.3	112 16.7	N20 01.1	150 32.9	N23 03.4	92 25.4	N12 33.4
D	13	260 20.5	31 57.3	52.2	127 18.6	01.1	165 35.6	03.4	107 27.8	33.4
A	14	275 23.0	46 56.6	53.1	142 20.6	01.1	180 38.4	03.4	122 30.2	33.4
Y	15	290 25.5	61 55.9	·· 54.0	157 22.5	·· 01.0	195 41.1	·· 03.4	137 32.6	·· 33.4
	16	305 27.9	76 55.2	54.9	172 24.5	01.0	210 43.9	03.4	152 35.0	33.3
	17	320 30.4	91 54.5	55.9	187 26.4	01.0	225 46.6	03.4	167 37.4	33.3
	18	335 32.9	106 53.9	S16 56.8	202 28.4	N20 00.9	240 49.3	N23 03.4	182 39.8	N12 33.3
	19	350 35.3	121 53.2	57.7	217 30.3	00.9	255 52.1	03.4	197 42.2	33.3
	20	5 37.8	136 52.5	58.5	232 32.3	00.9	270 54.8	03.5	212 44.6	33.3
	21	20 40.3	151 51.8	16 59.4	247 34.2	·· 00.8	285 57.6	·· 03.5	227 47.0	·· 33.3
	22	35 42.7	166 51.1	17 00.3	262 36.2	00.8	301 00.3	03.5	242 49.4	33.2
	23	50 45.2	181 50.5	01.2	277 38.1	00.8	316 03.1	03.5	257 51.8	33.2
	Mer. Pass.	h m 19 41.5	v −0.7	d 0.9	v 1.9	d 0.0	v 2.7	d 0.0	v 2.4	d 0.0

STARS		
Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 38.3	S40 23.7
Achernar	335 46.3	S57 21.1
Acrux	173 39.6	S62 58.3
Adhara	255 33.3	S28 56.5
Aldebaran	291 19.8	N16 27.9
Alioth	166 44.7	N56 04.6
Alkaid	153 20.5	N49 25.3
Al Na'ir	28 17.4	S47 04.2
Alnilam	276 13.3	S 1 13.0
Alphard	218 22.4	S 8 33.7
Alphecca	126 34.1	N26 47.4
Alpheratz	358 11.1	N28 58.3
Altair	62 34.6	N 8 48.8
Ankàa	353 42.0	S42 25.7
Antares	112 59.6	S26 22.9
Arcturus	146 20.5	N19 17.9
Atria	108 26.0	S68 59.2
Avior	234 28.6	S59 26.1
Bellatrix	279 00.5	N 6 19.7
Betelgeuse	271 30.0	N 7 24.1
Canopus	264 07.6	S52 41.0
Capella	281 13.6	N45 58.5
Deneb	49 49.9	N45 12.4
Denebola	183 01.1	N14 41.7
Diphda	349 22.6	S18 06.5
Dubhe	194 24.7	N61 51.9
Elnath	278 46.2	N28 35.3
Eltanin	90 59.1	N51 29.8
Enif	34 13.5	N 9 46.6
Fomalhaut	15 53.5	S29 44.4
Gacrux	172 31.1	S56 59.1
Gienah	176 20.1	S17 25.0
Hadar	149 26.5	S60 15.8
Hamal	328 30.7	N23 21.6
Kaus Aust.	84 19.7	S34 23.7
Kochab	137 20.3	N74 14.7
Markab	14 05.0	N15 05.4
Menkar	314 42.8	N 4 00.2
Menkent	148 39.6	S36 15.5
Miaplacidus	221 44.9	S69 37.4
Mirfak	309 18.3	N49 47.0
Nunki	76 31.8	S26 19.4
Peacock	54 01.8	S56 48.5
Pollux	244 00.3	N28 04.6
Procyon	245 27.6	N 5 16.8
Rasalhague	96 31.7	N12 34.7
Regulus	208 12.0	N12 04.4
Rigel	281 37.5	S 8 13.7
Rigil Kent.	140 28.9	S60 44.4
Sabik	102 43.7	S15 41.7
Schedar	350 10.7	N56 25.2
Shaula	96 58.8	S37 05.2
Sirius	258 57.1	S16 41.2
Spica	158 59.8	S11 02.6
Suhail	223 12.0	S43 20.4
Vega	80 57.5	N38 46.1
Zuben'ubi	137 35.5	S15 56.9

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	133 32.6	10 51
Mars	227 18.2	4 35
Jupiter	265 05.0	2 04
Saturn	207 10.0	5 55

	G.M.T.	SUN		MOON				
		G.H.A.	Dec.	G.H.A.	v	Dec.	d	H.P.
	d h	° ′	° ′	° ′	′	° ′	′	′
	24 00	183 21.2	S20 28.8	21 57.2	13.2	N13 18.2	6.8	54.6
	01	198 21.0	29.3	36 29.4	13.1	13 25.0	6.7	54.6
	02	213 20.9	29.9	51 01.5	13.1	13 31.7	6.6	54.6
	03	228 20.7	·· 30.4	65 33.6	13.1	13 38.3	6.6	54.6
	04	243 20.5	30.9	80 05.7	13.1	13 44.9	6.6	54.5
	05	258 20.3	31.4	94 37.8	13.1	13 51.5	6.4	54.5
	06	273 20.1	S20 31.9	109 09.9	13.0	N13 57.9	6.4	54.5
	07	288 20.0	32.4	123 41.9	13.0	14 04.3	6.3	54.5
T	08	303 19.8	32.9	138 13.9	13.0	14 10.6	6.3	54.5
H	09	318 19.6	·· 33.4	152 45.9	13.0	14 16.9	6.2	54.5
U	10	333 19.4	33.9	167 17.9	13.0	14 23.1	6.1	54.5
R	11	348 19.2	34.4	181 49.9	13.0	14 29.2	6.1	54.5
S	12	3 19.1	S20 34.9	196 21.9	12.9	N14 35.3	6.0	54.5
D	13	18 18.9	35.4	210 53.8	13.0	14 41.3	5.9	54.4
A	14	33 18.7	35.9	225 25.8	12.9	14 47.2	5.8	54.4
Y	15	48 18.5	·· 36.4	239 57.7	12.9	14 53.0	5.8	54.4
	16	63 18.3	36.9	254 29.6	12.9	14 58.8	5.7	54.4
	17	78 18.1	37.4	269 01.5	12.9	15 04.5	5.7	54.4
	18	93 18.0	S20 37.9	283 33.4	12.8	N15 10.2	5.5	54.4
	19	108 17.8	38.4	298 05.2	12.9	15 15.7	5.5	54.4
	20	123 17.6	38.9	312 37.1	12.8	15 21.2	5.5	54.4
	21	138 17.4	·· 39.4	327 08.9	12.8	15 26.7	5.3	54.4
	22	153 17.2	39.9	341 40.7	12.8	15 32.0	5.3	54.3
	23	168 17.0	40.4	356 12.5	12.8	15 37.3	5.2	54.3
	25 00	183 16.8	S20 40.9	10 44.3	12.7	N15 42.5	5.2	54.3
	01	198 16.7	41.4	25 16.0	12.8	15 47.7	5.1	54.3
	02	213 16.5	41.9	39 47.8	12.7	15 52.8	4.9	54.3
	03	228 16.3	·· 42.4	54 19.5	12.7	15 57.7	5.0	54.3
	04	243 16.1	42.9	68 51.2	12.7	16 02.7	4.8	54.3
	05	258 15.9	43.4	83 22.9	12.7	16 07.5	4.8	54.3
	06	273 15.7	S20 43.9	97 54.6	12.7	N16 12.3	4.7	54.3
	07	288 15.5	44.3	112 26.3	12.6	16 17.0	4.6	54.3
	08	303 15.3	44.8	126 57.9	12.7	16 21.6	4.6	54.2
F	09	318 15.2	·· 45.3	141 29.6	12.6	16 26.2	4.4	54.2
R	10	333 15.0	45.8	156 01.2	12.6	16 30.6	4.4	54.2
I	11	348 14.8	46.3	170 32.8	12.6	16 35.0	4.3	54.2
D	12	3 14.6	S20 46.8	185 04.4	12.6	N16 39.3	4.3	54.2
A	13	18 14.4	47.3	199 36.0	12.6	16 43.6	4.1	54.2
Y	14	33 14.2	47.8	214 07.6	12.6	16 47.7	4.1	54.2
	15	48 14.0	·· 48.2	228 39.2	12.5	16 51.8	4.0	54.2
	16	63 13.8	48.7	243 10.7	12.5	16 55.8	4.0	54.2
	17	78 13.6	49.2	257 42.2	12.6	16 59.8	3.8	54.2
	18	93 13.4	S20 49.7	272 13.8	12.5	N17 03.6	3.8	54.2
	19	108 13.3	50.2	286 45.3	12.5	17 07.4	3.7	54.2
	20	123 13.1	50.7	301 16.8	12.5	17 11.1	3.6	54.1
	21	138 12.9	·· 51.1	315 48.3	12.5	17 14.7	3.5	54.1
	22	153 12.7	51.6	330 19.8	12.4	17 18.2	3.5	54.1
	23	168 12.5	52.1	344 51.2	12.5	17 21.7	3.3	54.1
	26 00	183 12.3	S20 52.6	359 22.7	12.4	N17 25.0	3.3	54.1
	01	198 12.1	53.1	13 54.1	12.5	17 28.3	3.2	54.1
	02	213 11.9	53.5	28 25.6	12.4	17 31.5	3.2	54.1
	03	228 11.7	·· 54.0	42 57.0	12.4	17 34.7	3.0	54.1
	04	243 11.5	54.5	57 28.4	12.4	17 37.7	3.0	54.1
	05	258 11.3	55.0	71 59.8	12.4	17 40.7	2.9	54.1
	06	273 11.1	S20 55.4	86 31.2	12.4	N17 43.6	2.8	54.1
	07	288 10.9	55.9	101 02.6	12.4	17 46.4	2.7	54.1
S	08	303 10.7	56.4	115 34.0	12.3	17 49.1	2.6	54.1
A	09	318 10.5	·· 56.9	130 05.3	12.4	17 51.7	2.6	54.1
T	10	333 10.3	57.3	144 36.7	12.4	17 54.3	2.5	54.1
U	11	348 10.1	57.8	159 08.1	12.3	17 56.8	2.4	54.1
R	12	3 09.9	S20 58.3	173 39.4	12.3	N17 59.2	2.3	54.0
D	13	18 09.7	58.7	188 10.7	12.4	18 01.5	2.2	54.0
A	14	33 09.6	59.2	202 42.1	12.3	18 03.7	2.2	54.0
Y	15	48 09.4	20 59.7	217 13.4	12.3	18 05.9	2.0	54.0
	16	63 09.2	21 00.1	231 44.7	12.3	18 07.9	2.0	54.0
	17	78 09.0	00.6	246 16.0	12.4	18 09.9	1.9	54.0
	18	93 08.8	S21 01.1	260 47.4	12.3	N18 11.8	1.8	54.0
	19	108 08.6	01.5	275 18.7	12.3	18 13.6	1.7	54.0
	20	123 08.4	02.0	289 50.0	12.3	18 15.3	1.7	54.0
	21	138 08.2	·· 02.5	304 21.3	12.3	18 17.0	1.5	54.0
	22	153 08.0	02.9	318 52.6	12.2	18 18.5	1.5	54.0
	23	168 07.8	03.4	333 23.8	12.3	18 20.0	1.4	54.0
		S.D. 16.2	d 0.5	S.D. 14.8		14.8		14.7

Lat.	Twilight		Sunrise	Moonrise			
	Naut.	Civil		24	25	26	27
°	h m	h m	h m	h m	h m	h m	h m
N 72	07 33	09 21	■	13 23	13 14	12 48	□
N 70	07 19	08 49	11 29	13 54	14 01	14 17	14 51
68	07 07	08 26	10 02	14 17	14 32	14 57	15 36
66	06 58	08 08	09 25	14 34	14 55	15 24	16 05
64	06 49	07 53	08 58	14 49	15 13	15 45	16 27
62	06 42	07 40	08 38	15 01	15 28	16 02	16 45
60	06 36	07 29	08 22	15 12	15 40	16 16	17 00
N 58	06 30	07 20	08 08	15 21	15 51	16 28	17 12
56	06 25	07 12	07 56	15 29	16 01	16 39	17 23
54	06 20	07 04	07 46	15 36	16 09	16 48	17 33
52	06 15	06 58	07 36	15 42	16 17	16 56	17 41
50	06 11	06 51	07 28	15 48	16 23	17 04	17 49
45	06 02	06 38	07 11	16 01	16 38	17 19	18 05
N 40	05 53	06 27	06 56	16 11	16 50	17 32	18 19
35	05 45	06 17	06 44	16 20	17 00	17 44	18 30
30	05 38	06 07	06 33	16 28	17 09	17 53	18 40
20	05 24	05 51	06 15	16 41	17 25	18 10	18 57
N 10	05 10	05 36	05 59	16 53	17 38	18 25	19 12
0	04 56	05 21	05 43	17 04	17 51	18 38	19 26
S 10	04 39	05 05	05 28	17 16	18 04	18 52	19 40
20	04 19	04 47	05 11	17 28	18 18	19 07	19 55
30	03 53	04 26	04 52	17 42	18 33	19 24	20 12
35	03 37	04 12	04 41	17 50	18 43	19 34	20 22
40	03 17	03 57	04 28	17 59	18 53	19 45	20 33
45	02 52	03 37	04 13	18 10	19 06	19 58	20 47
S 50	02 16	03 12	03 54	18 23	19 21	20 14	21 03
52	01 56	03 00	03 44	18 29	19 28	20 22	21 11
54	01 31	02 46	03 34	18 36	19 35	20 30	21 20
56	00 54	02 29	03 23	18 43	19 44	20 40	21 29
58	////	02 08	03 09	18 52	19 54	20 51	21 40
S 60	////	01 41	02 54	19 01	20 06	21 03	21 53

Lat.	Sunset	Twilight		Moonset			
		Civil	Naut.	24	25	26	27
°	h m	h m	h m	h m	h m	h m	h m
N 72	■	14 12	16 00	08 10	09 56	12 00	□
N 70	12 04	14 44	16 14	07 40	09 09	10 31	11 36
68	13 31	15 07	16 26	07 18	08 39	09 52	10 51
66	14 09	15 26	16 36	07 01	08 17	09 25	10 22
64	14 35	15 41	16 44	06 47	07 59	09 04	10 00
62	14 55	15 53	16 51	06 36	07 45	08 47	09 42
60	15 12	16 04	16 58	06 26	07 32	08 33	09 27
N 58	15 26	16 13	17 04	06 17	07 22	08 22	09 15
56	15 38	16 22	17 09	06 10	07 13	08 11	09 04
54	15 48	16 29	17 14	06 03	07 05	08 02	08 54
52	15 57	16 36	17 18	05 57	06 57	07 54	08 46
50	16 06	16 42	17 22	05 51	06 51	07 47	08 38
45	16 23	16 56	17 32	05 40	06 37	07 31	08 22
N 40	16 38	17 07	17 40	05 30	06 25	07 18	08 09
35	16 50	17 17	17 48	05 22	06 15	07 07	07 57
30	17 01	17 26	17 56	05 14	06 07	06 58	07 47
20	17 19	17 43	18 10	05 02	05 52	06 42	07 30
N 10	17 35	17 58	18 24	04 51	05 39	06 27	07 15
0	17 51	18 13	18 39	04 40	05 27	06 14	07 01
S 10	18 06	18 29	18 55	04 30	05 15	06 01	06 47
20	18 23	18 47	19 15	04 19	05 02	05 46	06 33
30	18 42	19 09	19 41	04 07	04 47	05 30	06 15
35	18 53	19 22	19 57	04 00	04 39	05 21	06 05
40	19 07	19 38	20 17	03 51	04 29	05 10	05 54
45	19 22	19 58	20 43	03 42	04 18	04 57	05 41
S 50	19 41	20 23	21 20	03 31	04 04	04 42	05 24
52	19 50	20 35	21 40	03 25	03 57	04 34	05 17
54	20 01	20 50	22 05	03 19	03 50	04 26	05 08
56	20 12	21 07	22 45	03 13	03 43	04 17	04 59
58	20 26	21 28	////	03 06	03 34	04 07	04 48
S 60	20 42	21 56	////	02 57	03 23	03 56	04 35

Day	SUN			MOON			
	Eqn. of Time		Mer. Pass.	Mer. Pass.		Age	Phase
	00ʰ	12ʰ		Upper	Lower		
	m s	m s	h m	h m	h m	d	
24	13 25	13 17	11 47	23 16	10 52	13	
25	13 08	12 59	11 47	24 03	11 39	14	○
26	12 50	12 40	11 47	00 03	12 26	15	

1977 NOVEMBER 27, 28, 29 (SUN., MON., TUES.)

	G.M.T.	ARIES	VENUS −3.4		MARS −0.1		JUPITER −2.3		SATURN +0.7	
		G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
	d h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
	27 00	65 47.7	196 49.8	S17 02.1	292 40.1	N20 00.7	331 05.8	N23 03.5	272 54.2	N12 33.2
	01	80 50.1	211 49.1	03.0	307 42.0	00.7	346 08.6	03.5	287 56.6	33.2
	02	95 52.6	226 48.4	03.9	322 44.0	00.7	1 11.3	03.5	302 59.0	33.2
	03	110 55.0	241 47.7	·· 04.8	337 45.9	·· 00.6	16 14.0	·· 03.5	318 01.4	·· 33.2
	04	125 57.5	256 47.0	05.7	352 47.9	00.6	31 16.8	03.6	333 03.8	33.2
	05	141 00.0	271 46.4	06.6	7 49.8	00.6	46 19.5	03.6	348 06.2	33.1
	06	156 02.4	286 45.7	S17 07.5	22 51.8	N20 00.5	61 22.3	N23 03.6	3 08.5	N12 33.1
	07	171 04.9	301 45.0	08.4	37 53.8	00.5	76 25.0	03.6	18 10.9	33.1
	08	186 07.4	316 44.3	09.3	52 55.7	00.5	91 27.8	03.6	33 13.3	33.1
S	09	201 09.8	331 43.6	·· 10.2	67 57.7	·· 00.5	106 30.5	·· 03.6	48 15.7	·· 33.1
U	10	216 12.3	346 42.9	11.1	82 59.6	00.4	121 33.3	03.6	63 18.1	33.1
N	11	231 14.8	1 42.2	11.9	98 01.6	00.4	136 36.0	03.6	78 20.5	33.1
D	12	246 17.2	16 41.5	S17 12.8	113 03.6	N20 00.4	151 38.8	N23 03.7	93 22.9	N12 33.0
A	13	261 19.7	31 40.9	13.7	128 05.5	00.3	166 41.5	03.7	108 25.3	33.0
Y	14	276 22.2	46 40.2	14.6	143 07.5	00.3	181 44.3	03.7	123 27.7	33.0
	15	291 24.6	61 39.5	·· 15.5	158 09.5	·· 00.3	196 47.0	·· 03.7	138 30.1	·· 33.0
	16	306 27.1	76 38.8	16.4	173 11.4	00.3	211 49.7	03.7	153 32.5	33.0
	17	321 29.5	91 38.1	17.2	188 13.4	00.2	226 52.5	03.7	168 34.9	33.0
	18	336 32.0	106 37.4	S17 18.1	203 15.4	N20 00.2	241 55.2	N23 03.7	183 37.3	N12 33.0
	19	351 34.5	121 36.7	19.0	218 17.4	00.2	256 58.0	03.7	198 39.7	32.9
	20	6 36.9	136 36.0	19.9	233 19.3	00.2	272 00.7	03.8	213 42.1	32.9
	21	21 39.4	151 35.3	·· 20.8	248 21.3	·· 00.1	287 03.5	·· 03.8	228 44.5	·· 32.9
	22	36 41.9	166 34.6	21.6	263 23.3	00.1	302 06.2	03.8	243 46.9	32.9
	23	51 44.3	181 33.9	22.5	278 25.3	00.1	317 09.0	03.8	258 49.3	32.9
	28 00	66 46.8	196 33.2	S17 23.4	293 27.2	N20 00.1	332 11.7	N23 03.8	273 51.7	N12 32.9
	01	81 49.3	211 32.5	24.3	308 29.2	00.0	347 14.5	03.8	288 54.1	32.9
	02	96 51.7	226 31.8	25.2	323 31.2	00.0	2 17.2	03.8	303 56.5	32.8
	03	111 54.2	241 31.1	·· 26.0	338 33.2	·· 00.0	17 20.0	·· 03.8	318 58.9	·· 32.8
	04	126 56.6	256 30.4	26.9	353 35.2	20 00.0	32 22.7	03.9	334 01.3	32.8
	05	141 59.1	271 29.7	27.8	8 37.2	19 59.9	47 25.5	03.9	349 03.7	32.8
	06	157 01.6	286 29.0	S17 28.6	23 39.1	N19 59.9	62 28.2	N23 03.9	4 06.1	N12 32.8
	07	172 04.0	301 28.3	29.5	38 41.1	59.9	77 31.0	03.9	19 08.5	32.8
	08	187 06.5	316 27.6	30.4	53 43.1	59.9	92 33.8	03.9	34 10.9	32.8
M	09	202 09.0	331 26.9	·· 31.3	68 45.1	·· 59.9	107 36.5	·· 03.9	49 13.3	·· 32.8
O	10	217 11.4	346 26.2	32.1	83 47.1	59.8	122 39.3	03.9	64 15.7	32.7
N	11	232 13.9	1 25.5	33.0	98 49.1	59.8	137 42.0	03.9	79 18.2	32.7
D	12	247 16.4	16 24.8	S17 33.9	113 51.1	N19 59.8	152 44.8	N23 04.0	94 20.6	N12 32.7
A	13	262 18.8	31 24.1	34.7	128 53.1	59.8	167 47.5	04.0	109 23.0	32.7
Y	14	277 21.3	46 23.4	35.6	143 55.1	59.8	182 50.3	04.0	124 25.4	32.7
	15	292 23.8	61 22.7	·· 36.5	158 57.1	·· 59.7	197 53.0	·· 04.0	139 27.8	·· 32.7
	16	307 26.2	76 22.0	37.3	173 59.1	59.7	212 55.8	04.0	154 30.2	32.7
	17	322 28.7	91 21.3	38.2	189 01.1	59.7	227 58.5	04.0	169 32.6	32.7
	18	337 31.1	106 20.6	S17 39.0	204 03.1	N19 59.7	243 01.3	N23 04.0	184 35.0	N12 32.6
	19	352 33.6	121 19.9	39.9	219 05.1	59.7	258 04.0	04.1	199 37.4	32.6
	20	7 36.1	136 19.2	40.8	234 07.1	59.6	273 06.8	04.1	214 39.8	32.6
	21	22 38.5	151 18.5	·· 41.6	249 09.1	·· 59.6	288 09.6	·· 04.1	229 42.2	·· 32.6
	22	37 41.0	166 17.8	42.5	264 11.1	59.6	303 12.3	04.1	244 44.6	32.6
	23	52 43.5	181 17.1	43.3	279 13.1	59.6	318 15.1	04.1	259 47.0	32.6
	29 00	67 45.9	196 16.4	S17 44.2	294 15.1	N19 59.6	333 17.8	N23 04.1	274 49.4	N12 32.6
	01	82 48.4	211 15.7	45.1	309 17.1	59.6	348 20.6	04.1	289 51.8	32.6
	02	97 50.9	226 15.0	45.9	324 19.1	59.5	3 23.3	04.1	304 54.2	32.6
	03	112 53.3	241 14.3	·· 46.8	339 21.1	·· 59.5	18 26.1	·· 04.2	319 56.6	·· 32.5
	04	127 55.8	256 13.5	47.6	354 23.1	59.5	33 28.9	04.2	334 59.0	32.5
	05	142 58.3	271 12.8	48.5	9 25.1	59.5	48 31.6	04.2	350 01.4	32.5
	06	158 00.7	286 12.1	S17 49.3	24 27.1	N19 59.5	63 34.4	N23 04.2	5 03.8	N12 32.5
	07	173 03.2	301 11.4	50.2	39 29.2	59.5	78 37.1	04.2	20 06.2	32.5
T	08	188 05.6	316 10.7	51.0	54 31.2	59.5	93 39.9	04.2	35 08.6	32.5
U	09	203 08.1	331 10.0	·· 51.9	69 33.2	·· 59.4	108 42.6	·· 04.2	50 11.1	·· 32.5
E	10	218 10.6	346 09.3	52.7	84 35.2	59.4	123 45.4	04.2	65 13.5	32.5
S	11	233 13.0	1 08.6	53.6	99 37.2	59.4	138 48.2	04.3	80 15.9	32.4
D	12	248 15.5	16 07.8	S17 54.4	114 39.2	N19 59.4	153 50.9	N23 04.3	95 18.3	N12 32.4
A	13	263 18.0	31 07.1	55.3	129 41.3	59.4	168 53.7	04.3	110 20.7	32.4
Y	14	278 20.4	46 06.4	56.1	144 43.3	59.4	183 56.4	04.3	125 23.1	32.4
	15	293 22.9	61 05.7	·· 57.0	159 45.3	·· 59.4	198 59.2	·· 04.3	140 25.5	·· 32.4
	16	308 25.4	76 05.0	57.8	174 47.3	59.3	214 02.0	04.3	155 27.9	32.4
	17	323 27.8	91 04.3	58.6	189 49.4	59.3	229 04.7	04.3	170 30.3	32.4
	18	338 30.3	106 03.5	S17 59.5	204 51.4	N19 59.3	244 07.5	N23 04.3	185 32.7	N12 32.4
	19	353 32.7	121 02.8	18 00.3	219 53.4	59.3	259 10.2	04.4	200 35.1	32.4
	20	8 35.2	136 02.1	01.2	234 55.4	59.3	274 13.0	04.4	215 37.5	32.4
	21	23 37.7	151 01.4	·· 02.0	249 57.5	·· 59.3	289 15.8	·· 04.4	230 40.0	·· 32.3
	22	38 40.1	166 00.7	02.9	264 59.5	59.3	304 18.5	04.4	245 42.4	32.3
	23	53 42.6	180 59.9	03.7	280 01.5	59.3	319 21.3	04.4	260 44.8	32.3
	Mer. Pass.	h m 19 29.7	*v* −0.7	*d* 0.9	*v* 2.0	*d* 0.0	*v* 2.8	*d* 0.0	*v* 2.4	*d* 0.0

STARS		
Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 38.3	S40 23.7
Achernar	335 46.3	S57 21.1
Acrux	173 39.6	S62 58.3
Adhara	255 33.3	S28 56.5
Aldebaran	291 19.8	N16 27.9
Alioth	166 44.6	N56 04.6
Alkaid	153 20.5	N49 25.3
Al Na'ir	28 17.5	S47 04.2
Alnilam	276 13.3	S 1 13.0
Alphard	218 22.3	S 8 33.7
Alphecca	126 34.1	N26 47.4
Alpheratz	358 11.1	N28 58.3
Altair	62 34.6	N 8 48.8
Ankaa	353 42.0	S42 25.7
Antares	112 59.6	S26 22.9
Arcturus	146 20.5	N19 17.9
Atria	108 26.0	S68 59.2
Avior	234 28.5	S59 26.1
Bellatrix	279 00.5	N 6 19.7
Betelgeuse	271 30.0	N 7 24.1
Canopus	264 07.5	S52 41.0
Capella	281 13.6	N45 58.5
Deneb	49 49.9	N45 12.4
Denebola	183 01.1	N14 41.7
Diphda	349 22.6	S18 06.5
Dubhe	194 24.7	N61 51.9
Elnath	278 46.2	N28 35.3
Eltanin	90 59.1	N51 29.7
Enif	34 13.5	N 9 46.6
Fomalhaut	15 53.5	S29 44.4
Gacrux	172 31.1	S56 59.1
Gienah	176 20.1	S17 25.0
Hadar	149 26.5	S60 15.8
Hamal	328 30.7	N23 21.6
Kaus Aust.	84 19.7	S34 23.7
Kochab	137 20.2	N74 14.7
Markab	14 05.0	N15 05.4
Menkar	314 42.8	N 4 00.2
Menkent	148 39.5	S36 15.5
Miaplacidus	221 44.9	S69 37.4
Mirfak	309 18.3	N49 47.0
Nunki	76 31.8	S26 19.4
Peacock	54 01.8	S56 48.5
Pollux	244 00.3	N28 04.6
Procyon	245 27.5	N 5 16.8
Rasalhague	96 31.7	N12 34.7
Regulus	208 12.0	N12 04.4
Rigel	281 37.5	S 8 13.7
Rigil Kent.	140 28.9	S60 44.4
Sabik	102 43.7	S15 41.7
Schedar	350 10.7	N56 25.2
Shaula	96 58.7	S37 05.2
Sirius	258 57.1	S16 41.2
Spica	158 59.8	S11 02.6
Suhail	223 12.0	S43 20.4
Vega	80 57.5	N38 46.1
Zuben'ubi	137 35.4	S15 56.9

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	129 46.4	10 54
Mars	226 40.5	4 26
Jupiter	265 24.9	1 51
Saturn	207 04.9	5 44

G.M.T.	SUN G.H.A.	SUN Dec.	MOON G.H.A.	*v*	MOON Dec.	*d*	H.P.
d h	° ′	° ′	° ′	′	° ′	′	′
27 00	183 07.6	S21 03.9	347 55.1	12.3	N18 21.4	1.3	54.0
01	198 07.4	04.3	2 26.4	12.3	18 22.7	1.2	54.0
02	213 07.2	04.8	16 57.7	12.3	18 23.9	1.1	54.0
03	228 06.9	· · 05.2	31 29.0	12.3	18 25.0	1.1	54.0
04	243 06.7	05.7	46 00.3	12.2	18 26.1	1.0	54.0
05	258 06.5	06.2	60 31.5	12.3	18 27.1	0.8	54.0
06	273 06.3	S21 06.6	75 02.8	12.3	N18 27.9	0.8	54.0
07	288 06.1	07.1	89 34.1	12.3	18 28.7	0.8	54.0
08	303 05.9	07.5	104 05.4	12.2	18 29.5	0.6	54.0
S 09	318 05.7	· · 08.0	118 36.6	12.3	18 30.1	0.5	54.0
U 10	333 05.5	08.5	133 07.9	12.3	18 30.6	0.5	54.0
N 11	348 05.3	08.9	147 39.2	12.3	18 31.1	0.4	54.0
D 12	3 05.1	S21 09.4	162 10.5	12.2	N18 31.5	0.2	54.0
A 13	18 04.9	09.8	176 41.7	12.3	18 31.7	0.3	54.0
Y 14	33 04.7	10.3	191 13.0	12.3	18 32.0	0.1	54.0
15	48 04.5	· · 10.7	205 44.3	12.3	18 32.1	0.0	54.0
16	63 04.3	11.2	220 15.6	12.3	18 32.1	0.0	54.0
17	78 04.1	11.6	234 46.9	12.3	18 32.1	0.2	54.0
18	93 03.9	S21 12.1	249 18.2	12.2	N18 31.9	0.2	54.0
19	108 03.7	12.5	263 49.4	12.3	18 31.7	0.3	54.0
20	123 03.5	13.0	278 20.7	12.3	18 31.4	0.4	54.0
21	138 03.3	· · 13.4	292 52.0	12.4	18 31.0	0.5	54.0
22	153 03.1	13.9	307 23.4	12.3	18 30.5	0.5	54.0
23	168 02.8	14.3	321 54.7	12.3	18 30.0	0.7	54.0
28 00	183 02.6	S21 14.8	336 26.0	12.3	N18 29.3	0.7	54.0
01	198 02.4	15.2	350 57.3	12.3	18 28.6	0.8	54.0
02	213 02.2	15.6	5 28.6	12.4	18 27.8	0.9	54.0
03	228 02.0	· · 16.1	20 00.0	12.3	18 26.9	1.0	54.0
04	243 01.8	16.5	34 31.3	12.4	18 25.9	1.1	54.0
05	258 01.6	17.0	49 02.7	12.3	18 24.8	1.1	54.0
06	273 01.4	S21 17.4	63 34.0	12.4	N18 23.7	1.3	54.0
07	288 01.2	17.9	78 05.4	12.3	18 22.4	1.3	54.0
08	303 01.0	18.3	92 36.7	12.4	18 21.1	1.4	54.0
M 09	318 00.7	· · 18.7	107 08.1	12.4	18 19.7	1.5	54.0
O 10	333 00.5	19.2	121 39.5	12.4	18 18.2	1.5	54.0
N 11	348 00.3	19.6	136 10.9	12.4	18 16.7	1.7	54.0
D 12	3 00.1	S21 20.1	150 42.3	12.4	N18 15.0	1.7	54.0
A 13	17 59.9	20.5	165 13.7	12.5	18 13.3	1.8	54.0
Y 14	32 59.7	20.9	179 45.2	12.4	18 11.5	1.9	54.0
15	47 59.5	· · 21.4	194 16.6	12.4	18 09.6	2.0	54.0
16	62 59.3	21.8	208 48.0	12.5	18 07.6	2.1	54.0
17	77 59.0	22.2	223 19.5	12.5	18 05.5	2.1	54.0
18	92 58.8	S21 22.7	237 51.0	12.4	N18 03.4	2.3	54.0
19	107 58.6	23.1	252 22.4	12.5	18 01.1	2.3	54.0
20	122 58.4	23.5	266 53.9	12.5	17 58.8	2.4	54.0
21	137 58.2	· · 24.0	281 25.4	12.5	17 56.4	2.4	54.0
22	152 58.0	24.4	295 56.9	12.5	17 54.0	2.6	54.0
23	167 57.7	24.8	310 28.4	12.6	17 51.4	2.6	54.0
29 00	182 57.5	S21 25.2	325 00.0	12.5	N17 48.8	2.8	54.0
01	197 57.3	25.7	339 31.5	12.6	17 46.0	2.8	54.0
02	212 57.1	26.1	354 03.1	12.6	17 43.2	2.8	54.0
03	227 56.9	· · 26.5	8 34.7	12.5	17 40.4	3.0	54.0
04	242 56.7	27.0	23 06.2	12.6	17 37.4	3.0	54.1
05	257 56.4	27.4	37 37.8	12.6	17 34.4	3.2	54.1
06	272 56.2	S21 27.8	52 09.4	12.7	N17 31.2	3.2	54.1
07	287 56.0	28.2	66 41.1	12.6	17 28.0	3.2	54.1
08	302 55.8	28.7	81 12.7	12.7	17 24.8	3.4	54.1
T 09	317 55.6	· · 29.1	95 44.4	12.6	17 21.4	3.4	54.1
U 10	332 55.4	29.5	110 16.0	12.7	17 18.0	3.6	54.1
E 11	347 55.1	29.9	124 47.7	12.7	17 14.4	3.6	54.1
S 12	2 54.9	S21 30.3	139 19.4	12.7	N17 10.8	3.6	54.1
D 13	17 54.7	30.8	153 51.1	12.7	17 07.2	3.8	54.1
A 14	32 54.5	31.2	168 22.8	12.8	17 03.4	3.8	54.1
Y 15	47 54.3	· · 31.6	182 54.6	12.7	16 59.6	3.9	54.1
16	62 54.0	32.0	197 26.3	12.8	16 55.7	4.0	54.1
17	77 53.8	32.4	211 58.1	12.7	16 51.7	4.1	54.1
18	92 53.6	S21 32.9	226 29.8	12.8	N16 47.6	4.1	54.2
19	107 53.4	33.3	241 01.6	12.8	16 43.5	4.2	54.2
20	122 53.1	33.7	255 33.4	12.9	16 39.3	4.3	54.2
21	137 52.9	· · 34.1	270 05.3	12.8	16 35.0	4.4	54.2
22	152 52.7	34.5	284 37.1	12.9	16 30.6	4.4	54.2
23	167 52.5	34.9	299 09.0	12.8	16 26.2	4.5	54.2
	S.D. 16.2	*d* 0.4	S.D. 14.7		14.7		14.7

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 27	Moonrise 28	Moonrise 29	Moonrise 30
°	h m	h m	h m	h m	h m	h m	h m
N 72	07 42	09 36	■	□	□	16 17	18 04
N 70	07 27	09 00	■	14 51	15 50	17 09	18 36
68	07 15	08 35	10 18	15 36	16 31	17 41	19 00
66	07 04	08 15	09 36	16 05	16 59	18 05	19 18
64	06 55	08 00	09 07	16 27	17 20	18 23	19 33
62	06 48	07 46	08 46	16 45	17 37	18 38	19 46
60	06 41	07 35	08 28	17 00	17 52	18 51	19 56
N 58	06 35	07 25	08 14	17 12	18 04	19 02	20 05
56	06 29	07 17	08 01	17 23	18 14	19 11	20 13
54	06 24	07 09	07 51	17 33	18 24	19 20	20 20
52	06 19	07 02	07 41	17 41	18 32	19 27	20 26
50	06 15	06 55	07 32	17 49	18 39	19 34	20 32
45	06 05	06 41	07 14	18 05	18 55	19 48	20 44
N 40	05 56	06 30	06 59	18 19	19 08	20 00	20 55
35	05 48	06 19	06 47	18 30	19 19	20 10	21 03
30	05 40	06 10	06 36	18 40	19 29	20 19	21 11
20	05 26	05 53	06 17	18 57	19 45	20 34	21 24
N 10	05 12	05 38	06 00	19 12	20 00	20 48	21 36
0	04 56	05 22	05 44	19 26	20 13	21 00	21 46
S 10	04 39	05 06	05 28	19 40	20 27	21 12	21 57
20	04 19	04 47	05 11	19 55	20 41	21 26	22 08
30	03 52	04 25	04 52	20 12	20 58	21 41	22 21
35	03 36	04 11	04 40	20 22	21 07	21 50	22 29
40	03 15	03 55	04 27	20 33	21 18	22 00	22 38
45	02 49	03 35	04 11	20 47	21 31	22 11	22 47
S 50	02 11	03 09	03 51	21 03	21 47	22 26	23 00
52	01 50	02 56	03 42	21 11	21 54	22 32	23 05
54	01 23	02 41	03 31	21 20	22 03	22 39	23 11
56	00 39	02 24	03 19	21 29	22 12	22 48	23 18
58	////	02 02	03 05	21 40	22 22	22 57	23 26
S 60	////	01 32	02 48	21 53	22 34	23 07	23 34

Lat.	Sunset	Twilight Civil	Twilight Naut.	Moonset 27	Moonset 28	Moonset 29	Moonset 30
°	h m	h m	h m	h m	h m	h m	h m
N 72	■	14 00	15 53	□	□	13 26	13 16
N 70	■	14 35	16 08	11 36	12 15	12 34	12 42
68	13 17	15 00	16 21	10 51	11 34	12 01	12 18
66	14 00	15 20	16 31	10 22	11 06	11 37	11 59
64	14 28	15 36	16 40	10 00	10 44	11 18	11 44
62	14 50	15 49	16 48	09 42	10 27	11 03	11 31
60	15 07	16 00	16 55	09 27	10 13	10 50	11 20
N 58	15 22	16 10	17 01	09 15	10 00	10 39	11 10
56	15 34	16 19	17 06	09 04	09 50	10 29	11 02
54	15 45	16 27	17 12	08 54	09 40	10 20	10 54
52	15 55	16 34	17 16	08 46	09 32	10 13	10 48
50	16 03	16 40	17 21	08 38	09 25	10 06	10 42
45	16 21	16 54	17 31	08 22	09 09	09 51	10 29
N 40	16 36	17 06	17 40	08 09	08 55	09 38	10 18
35	16 49	17 17	17 48	07 57	08 44	09 28	10 09
30	17 00	17 26	17 55	07 47	08 34	09 19	10 01
20	17 19	17 43	18 10	07 30	08 17	09 03	09 46
N 10	17 36	17 58	18 24	07 15	08 03	08 49	09 34
0	17 52	18 14	18 40	07 01	07 49	08 36	09 22
S 10	18 08	18 30	18 57	06 47	07 35	08 23	09 11
20	18 25	18 49	19 17	06 33	07 20	08 09	08 58
30	18 45	19 11	19 44	06 15	07 03	07 53	08 44
35	18 56	19 25	20 01	06 05	06 53	07 43	08 36
40	19 10	19 42	20 21	05 54	06 42	07 33	08 26
45	19 26	20 02	20 48	05 41	06 28	07 20	08 15
S 50	19 46	20 28	21 26	05 24	06 12	07 05	08 01
52	19 55	20 41	21 47	05 17	06 04	06 58	07 55
54	20 06	20 56	22 16	05 08	05 56	06 50	07 48
56	20 18	21 14	23 03	04 59	05 46	06 41	07 40
58	20 32	21 36	////	04 48	05 35	06 30	07 31
S 60	20 49	22 07	////	04 35	05 23	06 19	07 21

Day	SUN Eqn. of Time 00ʰ	SUN Eqn. of Time 12ʰ	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
	m s	m s	h m	h m	h m	d	
27	12 31	12 21	11 48	00 50	13 14	16	◐
28	12 11	12 01	11 48	01 37	14 01	17	
29	11 51	11 40	11 48	02 25	14 48	18	

1977 NOV. 30, DEC. 1, 2 (WED., THURS., FRI.)

G.M.T.		ARIES	VENUS −3.4		MARS −0.1		JUPITER −2.3		SATURN +0.7	
		G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
d h		° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
30 00		68 45.1	195 59.2	S18 04.5	295 03.6	N19 59.3	334 24.1	N23 04.4	275 47.2	N12 32.3
01		83 47.5	210 58.5	05.4	310 05.6	59.3	349 26.8	04.4	290 49.6	32.3
02		98 50.0	225 57.8	06.2	325 07.6	59.3	4 29.6	04.4	305 52.0	32.3
03		113 52.5	240 57.1	·· 07.0	340 09.7	·· 59.2	19 32.3	·· 04.5	320 54.4	·· 32.3
04		128 54.9	255 56.3	07.9	355 11.7	59.2	34 35.1	04.5	335 56.8	32.3
05		143 57.4	270 55.6	08.7	10 13.7	59.2	49 37.9	04.5	350 59.2	32.3
06		158 59.9	285 54.9	S18 09.5	25 15.8	N19 59.2	64 40.6	N23 04.5	6 01.6	N12 32.3
07	W	174 02.3	300 54.2	10.4	40 17.8	59.2	79 43.4	04.5	21 04.0	32.2
08	E	189 04.8	315 53.4	11.2	55 19.9	59.2	94 46.2	04.5	36 06.5	32.2
09	D	204 07.2	330 52.7	·· 12.0	70 21.9	·· 59.2	109 48.9	·· 04.5	51 08.9	·· 32.2
10	N	219 09.7	345 52.0	12.9	85 24.0	59.2	124 51.7	04.6	66 11.3	32.2
11	E	234 12.2	0 51.3	13.7	100 26.0	59.2	139 54.5	04.6	81 13.7	32.2
12	S	249 14.6	15 50.5	S18 14.5	115 28.1	N19 59.2	154 57.2	N23 04.6	96 16.1	N12 32.2
13	D	264 17.1	30 49.8	15.3	130 30.1	59.2	170 00.0	04.6	111 18.5	32.2
14	A	279 19.6	45 49.1	16.2	145 32.2	59.2	185 02.8	04.6	126 20.9	32.2
15	Y	294 22.0	60 48.4	·· 17.0	160 34.2	·· 59.2	200 05.5	·· 04.6	141 23.3	·· 32.2
16		309 24.5	75 47.6	17.8	175 36.3	59.2	215 08.3	04.6	156 25.8	32.2
17		324 27.0	90 46.9	18.6	190 38.3	59.2	230 11.1	04.6	171 28.2	32.1
18		339 29.4	105 46.2	S18 19.4	205 40.4	N19 59.2	245 13.8	N23 04.7	186 30.6	N12 32.1
19		354 31.9	120 45.4	20.3	220 42.4	59.2	260 16.6	04.7	201 33.0	32.1
20		9 34.4	135 44.7	21.1	235 44.5	59.2	275 19.4	04.7	216 35.4	32.1
21		24 36.8	150 44.0	·· 21.9	250 46.5	·· 59.2	290 22.1	·· 04.7	231 37.8	·· 32.1
22		39 39.3	165 43.2	22.7	265 48.6	59.2	305 24.9	04.7	246 40.2	32.1
23		54 41.7	180 42.5	23.5	280 50.7	59.2	320 27.7	04.7	261 42.6	32.1
1 00		69 44.2	195 41.8	S18 24.4	295 52.7	N19 59.2	335 30.4	N23 04.7	276 45.1	N12 32.1
01		84 46.7	210 41.0	25.2	310 54.8	59.2	350 33.2	04.7	291 47.5	32.1
02		99 49.1	225 40.3	26.0	325 56.8	59.2	5 36.0	04.8	306 49.9	32.1
03		114 51.6	240 39.6	·· 26.8	340 58.9	·· 59.2	20 38.7	·· 04.8	321 52.3	·· 32.1
04		129 54.1	255 38.8	27.6	356 01.0	59.2	35 41.5	04.8	336 54.7	32.1
05		144 56.5	270 38.1	28.4	11 03.0	59.2	50 44.3	04.8	351 57.1	32.0
06		159 59.0	285 37.4	S18 29.2	26 05.1	N19 59.2	65 47.0	N23 04.8	6 59.5	N12 32.0
07		175 01.5	300 36.6	30.1	41 07.2	59.2	80 49.8	04.8	22 02.0	32.0
08	T	190 03.9	315 35.9	30.9	56 09.2	59.2	95 52.6	04.8	37 04.4	32.0
09	H	205 06.4	330 35.1	·· 31.7	71 11.3	·· 59.2	110 55.4	·· 04.8	52 06.8	·· 32.0
10	U	220 08.8	345 34.4	32.5	86 13.4	59.2	125 58.1	04.9	67 09.2	32.0
11	R	235 11.3	0 33.7	33.3	101 15.5	59.2	141 00.9	04.9	82 11.6	32.0
12	S	250 13.8	15 32.9	S18 34.1	116 17.5	N19 59.2	156 03.7	N23 04.9	97 14.0	N12 32.0
13	D	265 16.2	30 32.2	34.9	131 19.6	59.2	171 06.4	04.9	112 16.5	32.0
14	A	280 18.7	45 31.5	35.7	146 21.7	59.2	186 09.2	04.9	127 18.9	32.0
15	Y	295 21.2	60 30.7	·· 36.5	161 23.8	·· 59.2	201 12.0	·· 04.9	142 21.3	·· 32.0
16		310 23.6	75 30.0	37.3	176 25.9	59.2	216 14.8	04.9	157 23.7	32.0
17		325 26.1	90 29.2	38.1	191 27.9	59.2	231 17.5	04.9	172 26.1	32.0
18		340 28.6	105 28.5	S18 38.9	206 30.0	N19 59.2	246 20.3	N23 05.0	187 28.5	N12 31.9
19		355 31.0	120 27.7	39.7	221 32.1	59.2	261 23.1	05.0	202 31.0	31.9
20		10 33.5	135 27.0	40.5	236 34.2	59.2	276 25.9	05.0	217 33.4	31.9
21		25 36.0	150 26.3	·· 41.3	251 36.3	·· 59.2	291 28.6	·· 05.0	232 35.8	·· 31.9
22		40 38.4	165 25.5	42.1	266 38.4	59.2	306 31.4	05.0	247 38.2	31.9
23		55 40.9	180 24.8	42.9	281 40.4	59.2	321 34.2	05.0	262 40.6	31.9
2 00		70 43.3	195 24.0	S18 43.7	296 42.5	N19 59.2	336 36.9	N23 05.0	277 43.0	N12 31.9
01		85 45.8	210 23.3	44.5	311 44.6	59.3	351 39.7	05.0	292 45.5	31.9
02		100 48.3	225 22.5	45.3	326 46.7	59.3	6 42.5	05.1	307 47.9	31.9
03		115 50.7	240 21.8	·· 46.1	341 48.8	·· 59.3	21 45.3	·· 05.1	322 50.3	·· 31.9
04		130 53.2	255 21.0	46.9	356 50.9	59.3	36 48.0	05.1	337 52.7	31.9
05		145 55.7	270 20.3	47.7	11 53.0	59.3	51 50.8	05.1	352 55.1	31.9
06		160 58.1	285 19.5	S18 48.5	26 55.1	N19 59.3	66 53.6	N23 05.1	7 57.6	N12 31.9
07		176 00.6	300 18.8	49.2	41 57.2	59.3	81 56.4	05.1	23 00.0	31.9
08		191 03.1	315 18.0	50.0	56 59.3	59.3	96 59.1	05.1	38 02.4	31.8
09	F	206 05.5	330 17.3	·· 50.8	72 01.4	·· 59.3	112 01.9	·· 05.2	53 04.8	·· 31.8
10	R	221 08.0	345 16.5	51.6	87 03.5	59.3	127 04.7	05.2	68 07.2	31.8
11	I	236 10.5	0 15.8	52.4	102 05.6	59.4	142 07.5	05.2	83 09.7	31.8
12	D	251 12.9	15 15.0	S18 53.2	117 07.7	N19 59.4	157 10.2	N23 05.2	98 12.1	N12 31.8
13	A	266 15.4	30 14.3	54.0	132 09.8	59.4	172 13.0	05.2	113 14.5	31.8
14	Y	281 17.8	45 13.5	54.7	147 11.9	59.4	187 15.8	05.2	128 16.9	31.8
15		296 20.3	60 12.8	·· 55.5	162 14.0	·· 59.4	202 18.6	·· 05.2	143 19.3	·· 31.8
16		311 22.8	75 12.0	56.3	177 16.1	59.4	217 21.4	05.2	158 21.8	31.8
17		326 25.2	90 11.3	57.1	192 18.3	59.4	232 24.1	05.3	173 24.2	31.8
18		341 27.7	105 10.5	S18 57.9	207 20.4	N19 59.4	247 26.9	N23 05.3	188 26.6	N12 31.8
19		356 30.2	120 09.7	58.6	222 22.5	59.5	262 29.7	05.3	203 29.0	31.8
20		11 32.6	135 09.0	18 59.4	237 24.6	59.5	277 32.5	05.3	218 31.4	31.8
21		26 35.1	150 08.2	19 00.2	252 26.7	·· 59.5	292 35.2	·· 05.3	233 33.9	·· 31.8
22		41 37.6	165 07.5	01.0	267 28.8	59.5	307 38.0	05.3	248 36.3	31.8
23		56 40.0	180 06.7	01.7	282 30.9	59.5	322 40.8	05.3	263 38.7	31.8
Mer. Pass.		h m 19 17.9	v −0.7	d 0.8	v 2.1	d 0.0	v 2.8	d 0.0	v 2.4	d 0.0

STARS		
Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 38.3	S40 23.7
Achernar	335 46.4	S57 21.1
Acrux	173 39.5	S62 58.3
Adhara	255 33.3	S28 56.5
Aldebaran	291 19.8	N16 27.9
Alioth	166 44.6	N56 04.6
Alkaid	153 20.4	N49 25.3
Al Na'ir	28 17.5	S47 04.2
Alnilam	276 13.3	S 1 13.0
Alphard	218 22.3	S 8 33.8
Alphecca	126 34.1	N26 47.4
Alpheratz	358 11.1	N28 58.3
Altair	62 34.6	N 8 48.8
Ankaa	353 42.0	S42 25.7
Antares	112 59.5	S26 22.9
Arcturus	146 20.5	N19 17.9
Atria	108 26.0	S68 59.2
Avior	234 28.5	S59 26.2
Bellatrix	279 00.4	N 6 19.7
Betelgeuse	271 30.0	N 7 24.1
Canopus	264 07.5	S52 41.0
Capella	281 13.6	N45 58.5
Deneb	49 50.0	N45 12.4
Denebola	183 01.1	N14 41.7
Diphda	349 22.6	S18 06.5
Dubhe	194 24.7	N61 51.9
Elnath	278 46.1	N28 35.3
Eltanin	90 59.1	N51 29.7
Enif	34 13.5	N 9 46.6
Fomalhaut	15 53.5	S29 44.4
Gacrux	172 31.0	S56 59.1
Gienah	176 20.0	S17 25.0
Hadar	149 26.4	S60 15.8
Hamal	328 30.7	N23 21.6
Kaus Aust.	84 19.7	S34 23.7
Kochab	137 20.2	N74 14.7
Markab	14 05.0	N15 05.4
Menkar	314 42.8	N 4 00.2
Menkent	148 39.5	S36 15.5
Miaplacidus	221 44.8	S69 37.4
Mirfak	309 18.3	N49 47.0
Nunki	76 31.8	S26 19.4
Peacock	54 01.8	S56 48.5
Pollux	244 00.2	N28 04.6
Procyon	245 27.5	N 5 16.8
Rasalhague	96 31.7	N12 34.7
Regulus	208 12.0	N12 04.4
Rigel	281 37.5	S 8 13.7
Rigil Kent.	140 28.9	S60 44.4
Sabik	102 43.7	S15 41.7
Schedar	350 10.8	N56 25.3
Shaula	96 58.7	S37 05.2
Sirius	258 57.1	S16 41.2
Spica	158 59.7	S11 02.7
Suhail	223 11.9	S43 20.4
Vega	80 57.5	N38 46.0
Zuben'ubi	137 35.4	S15 56.9

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	125 57.6	10 58
Mars	226 08.5	4 16
Jupiter	265 46.2	1 38
Saturn	207 00.9	5 32

	G.M.T.	SUN G.H.A.	SUN Dec.	MOON G.H.A.	*v*	MOON Dec.	*d*	H.P.
	d h	° ′	° ′	° ′	′	° ′	′	′
	30 00	182 52.3	S21 35.3	313 40.8	12.9	N16 21.7	4.6	54.2
	01	197 52.0	35.7	328 12.7	12.9	16 17.1	4.7	54.2
	02	212 51.8	36.2	342 44.6	12.9	16 12.4	4.7	54.2
	03	227 51.6	· · 36.6	357 16.5	12.9	16 07.7	4.8	54.2
	04	242 51.4	37.0	11 48.4	13.0	16 02.9	4.9	54.3
	05	257 51.1	37.4	26 20.4	12.9	15 58.0	4.9	54.3
	06	272 50.9	S21 37.8	40 52.3	13.0	N15 53.1	5.1	54.3
W	07	287 50.7	38.2	55 24.3	13.0	15 48.0	5.1	54.3
E	08	302 50.5	38.6	69 56.3	13.0	15 42.9	5.2	54.3
D	09	317 50.2	· · 39.0	84 28.3	13.0	15 37.7	5.2	54.3
N	10	332 50.0	39.4	99 00.3	13.0	15 32.5	5.3	54.3
E	11	347 49.8	39.8	113 32.3	13.1	15 27.2	5.4	54.3
S	12	2 49.6	S21 40.2	128 04.4	13.0	N15 21.8	5.5	54.4
D	13	17 49.3	40.6	142 36.4	13.1	15 16.3	5.5	54.4
A	14	32 49.1	41.0	157 08.5	13.1	15 10.8	5.6	54.4
Y	15	47 48.9	· · 41.4	171 40.6	13.1	15 05.2	5.7	54.4
	16	62 48.6	41.8	186 12.7	13.1	14 59.5	5.7	54.4
	17	77 48.4	42.2	200 44.8	13.1	14 53.8	5.8	54.4
	18	92 48.2	S21 42.6	215 16.9	13.2	N14 48.0	5.9	54.4
	19	107 48.0	43.0	229 49.1	13.1	14 42.1	5.9	54.5
	20	122 47.7	43.4	244 21.2	13.2	14 36.2	6.0	54.5
	21	137 47.5	· · 43.8	258 53.4	13.2	14 30.2	6.1	54.5
	22	152 47.3	44.2	273 25.6	13.2	14 24.1	6.2	54.5
	23	167 47.0	44.6	287 57.8	13.2	14 17.9	6.2	54.5
	1 00	182 46.8	S21 45.0	302 30.0	13.2	N14 11.7	6.2	54.5
	01	197 46.6	45.4	317 02.2	13.2	14 05.5	6.4	54.5
	02	212 46.3	45.8	331 34.4	13.2	13 59.1	6.4	54.6
	03	227 46.1	· · 46.2	346 06.6	13.3	13 52.7	6.5	54.6
	04	242 45.9	46.6	0 38.9	13.3	13 46.2	6.5	54.6
	05	257 45.6	47.0	15 11.2	13.2	13 39.7	6.6	54.6
	06	272 45.4	S21 47.4	29 43.4	13.3	N13 33.1	6.7	54.6
	07	287 45.2	47.8	44 15.7	13.3	13 26.4	6.7	54.7
T	08	302 45.0	48.1	58 48.0	13.3	13 19.7	6.8	54.7
H	09	317 44.7	· · 48.5	73 20.3	13.3	13 12.9	6.9	54.7
U	10	332 44.5	48.9	87 52.6	13.4	13 06.0	6.9	54.7
R	11	347 44.3	49.3	102 25.0	13.3	12 59.1	7.0	54.7
S	12	2 44.0	S21 49.7	116 57.3	13.3	N12 52.1	7.0	54.7
D	13	17 43.8	50.1	131 29.6	13.4	12 45.1	7.1	54.8
A	14	32 43.5	50.5	146 02.0	13.4	12 38.0	7.2	54.8
Y	15	47 43.3	· · 50.8	160 34.4	13.3	12 30.8	7.2	54.8
	16	62 43.1	51.2	175 06.7	13.4	12 23.6	7.3	54.8
	17	77 42.8	51.6	189 39.1	13.4	12 16.3	7.3	54.8
	18	92 42.6	S21 52.0	204 11.5	13.4	N12 09.0	7.4	54.9
	19	107 42.4	52.4	218 43.9	13.4	12 01.6	7.5	54.9
	20	122 42.1	52.8	233 16.3	13.4	11 54.1	7.5	54.9
	21	137 41.9	· · 53.1	247 48.7	13.4	11 46.6	7.6	54.9
	22	152 41.7	53.5	262 21.1	13.4	11 39.0	7.6	55.0
	23	167 41.4	53.9	276 53.5	13.4	11 31.4	7.7	55.0
	2 00	182 41.2	S21 54.3	291 25.9	13.5	N11 23.7	7.8	55.0
	01	197 41.0	54.6	305 58.4	13.4	11 15.9	7.8	55.0
	02	212 40.7	55.0	320 30.8	13.4	11 08.1	7.9	55.0
	03	227 40.5	· · 55.4	335 03.2	13.5	11 00.2	7.9	55.1
	04	242 40.2	55.8	349 35.7	13.4	10 52.3	7.9	55.1
	05	257 40.0	56.1	4 08.1	13.4	10 44.4	8.1	55.1
	06	272 39.8	S21 56.5	18 40.5	13.5	N10 36.3	8.0	55.1
	07	287 39.5	56.9	33 13.0	13.4	10 28.3	8.2	55.2
	08	302 39.3	57.3	47 45.4	13.5	10 20.1	8.2	55.2
F	09	317 39.0	· · 57.6	62 17.9	13.4	10 11.9	8.2	55.2
R	10	332 38.8	58.0	76 50.3	13.5	10 03.7	8.3	55.2
I	11	347 38.6	58.4	91 22.8	13.4	9 55.4	8.3	55.3
D	12	2 38.3	S21 58.7	105 55.2	13.5	N 9 47.1	8.4	55.3
A	13	17 38.1	59.1	120 27.7	13.4	9 38.7	8.5	55.3
Y	14	32 37.8	59.5	135 00.1	13.4	9 30.2	8.5	55.3
	15	47 37.6	21 59.8	149 32.5	13.5	9 21.7	8.5	55.4
	16	62 37.4	22 00.2	164 05.0	13.4	9 13.2	8.6	55.4
	17	77 37.1	00.6	178 37.4	13.4	9 04.6	8.6	55.4
	18	92 36.9	S22 00.9	193 09.8	13.5	N 8 56.0	8.7	55.4
	19	107 36.6	01.3	207 42.3	13.4	8 47.3	8.8	55.5
	20	122 36.4	01.7	222 14.7	13.4	8 38.5	8.7	55.5
	21	137 36.1	· · 02.0	236 47.1	13.4	8 29.8	8.9	55.5
	22	152 35.9	02.4	251 19.5	13.4	8 20.9	8.9	55.5
	23	167 35.7	02.7	265 51.9	13.4	8 12.0	8.9	55.6
		S.D. 16.2	*d* 0.4	S.D. 14.8		14.9		15.1

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 30	Moonrise 1	Moonrise 2	Moonrise 3
°	h m	h m	h m	h m	h m	h m	h m
N 72	07 51	09 50	▬	18 04	19 46	21 27	23 08
N 70	07 34	09 11	▬	18 36	20 07	21 40	23 14
68	07 21	08 43	10 36	19 00	20 24	21 50	23 19
66	07 10	08 23	09 46	19 18	20 37	21 59	23 23
64	07 01	08 06	09 16	19 33	20 48	22 06	23 27
62	06 53	07 52	08 53	19 46	20 57	22 12	23 30
60	06 46	07 41	08 35	19 56	21 05	22 18	23 33
N 58	06 39	07 30	08 20	20 05	21 12	22 22	23 35
56	06 33	07 21	08 07	20 13	21 18	22 26	23 37
54	06 28	07 13	07 55	20 20	21 24	22 30	23 39
52	06 23	07 06	07 45	20 26	21 29	22 34	23 41
50	06 18	06 59	07 37	20 32	21 33	22 37	23 42
45	06 08	06 45	07 18	20 44	21 43	22 43	23 46
N 40	05 59	06 32	07 02	20 55	21 51	22 49	23 49
35	05 50	06 22	06 49	21 03	21 58	22 54	23 51
30	05 43	06 12	06 38	21 11	22 04	22 58	23 53
20	05 28	05 55	06 19	21 24	22 14	23 05	23 57
N 10	05 13	05 39	06 01	21 36	22 23	23 12	24 00
0	04 57	05 23	05 45	21 46	22 32	23 18	24 03
S 10	04 40	05 06	05 29	21 57	22 41	23 23	24 06
20	04 19	04 47	05 12	22 08	22 50	23 30	24 10
30	03 52	04 24	04 51	22 21	23 00	23 37	24 14
35	03 35	04 10	04 39	22 29	23 06	23 41	24 16
40	03 13	03 54	04 26	22 38	23 13	23 46	24 18
45	02 46	03 33	04 09	22 47	23 21	23 51	24 21
S 50	02 07	03 06	03 49	23 00	23 30	23 58	24 24
52	01 45	02 53	03 39	23 05	23 34	24 01	00 01
54	01 15	02 38	03 28	23 11	23 39	24 04	00 04
56	00 18	02 19	03 16	23 18	23 44	24 08	00 08
58	////	01 55	03 01	23 26	23 50	24 12	00 12
S 60	////	01 23	02 44	23 34	23 57	24 16	00 16

Lat.	Sunset	Twilight Civil	Twilight Naut.	Moonset 30	Moonset 1	Moonset 2	Moonset 3
°	h m	h m	h m	h m	h m	h m	h m
N 72	▬	13 48	15 47	13 16	13 09	13 03	12 57
N 70	▬	14 27	16 03	12 42	12 46	12 48	12 49
68	13 02	14 54	16 16	12 18	12 29	12 36	12 42
66	13 51	15 15	16 27	11 59	12 15	12 27	12 36
64	14 22	15 31	16 37	11 44	12 03	12 18	12 31
62	14 45	15 45	16 45	11 31	11 53	12 11	12 27
60	15 03	15 57	16 52	11 20	11 44	12 05	12 23
N 58	15 18	16 07	16 58	11 10	11 37	12 00	12 20
56	15 31	16 16	17 04	11 02	11 30	11 55	12 17
54	15 42	16 25	17 10	10 54	11 24	11 50	12 14
52	15 52	16 32	17 15	10 48	11 19	11 46	12 12
50	16 01	16 39	17 19	10 42	11 14	11 43	12 10
45	16 20	16 53	17 30	10 29	11 03	11 35	12 05
N 40	16 35	17 05	17 39	10 18	10 54	11 28	12 01
35	16 48	17 16	17 47	10 09	10 47	11 23	11 57
30	17 00	17 26	17 55	10 01	10 40	11 18	11 54
20	17 19	17 43	18 10	09 46	10 28	11 09	11 49
N 10	17 37	17 59	18 25	09 34	10 18	11 01	11 44
0	17 53	18 15	18 41	09 22	10 08	10 54	11 39
S 10	18 09	18 32	18 59	09 11	09 59	10 47	11 35
20	18 27	18 51	19 20	08 58	09 48	10 39	11 30
30	18 47	19 14	19 47	08 44	09 36	10 30	11 24
35	18 59	19 28	20 04	08 36	09 29	10 24	11 21
40	19 13	19 45	20 25	08 26	09 21	10 19	11 17
45	19 29	20 06	20 53	08 15	09 12	10 12	11 13
S 50	19 50	20 33	21 33	08 01	09 01	10 03	11 08
52	20 00	20 46	21 55	07 55	08 56	09 59	11 05
54	20 11	21 02	22 26	07 48	08 50	09 55	11 03
56	20 23	21 21	23 31	07 40	08 44	09 50	11 00
58	20 38	21 45	////	07 31	08 36	09 45	10 56
S 60	20 56	22 18	////	07 21	08 28	09 39	10 53

Day	SUN Eqn. of Time 00ʰ	SUN Eqn. of Time 12ʰ	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	Age	Phase
	m s	m s	h m	h m	h m	d	
30	11 29	11 19	11 49	03 11	15 34	19	
1	11 08	10 57	11 49	03 57	16 20	20	◐
2	10 45	10 34	11 49	04 43	17 06	21	

	G.M.T.	ARIES	VENUS −3.4		MARS −0.2		JUPITER −2.3		SATURN +0.7	
	d h	G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
		° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
	3 00	71 42.5	195 06.0	S19 02.5	297 33.1	N19 59.5	337 43.6	N23 05.3	278 41.1	N12 31.8
	01	86 45.0	210 05.2	03.3	312 35.2	59.6	352 46.4	05.4	293 43.6	31.8
	02	101 47.4	225 04.4	04.1	327 37.3	59.6	7 49.1	05.4	308 46.0	31.7
	03	116 49.9	240 03.7	·· 04.8	342 39.4	·· 59.6	22 51.9	·· 05.4	323 48.4	·· 31.7
	04	131 52.3	255 02.9	05.6	357 41.5	59.6	37 54.7	05.4	338 50.8	31.7
	05	146 54.8	270 02.2	06.4	12 43.7	59.6	52 57.5	05.4	353 53.3	31.7
	06	161 57.3	285 01.4	S19 07.1	27 45.8	N19 59.6	68 00.3	N23 05.4	8 55.7	N12 31.7
	07	176 59.7	300 00.6	07.9	42 47.9	59.7	83 03.0	05.4	23 58.1	31.7
S	08	192 02.2	314 59.9	08.7	57 50.1	59.7	98 05.8	05.4	39 00.5	31.7
A	09	207 04.7	329 59.1	·· 09.4	72 52.2	·· 59.7	113 08.6	·· 05.5	54 02.9	·· 31.7
T	10	222 07.1	344 58.3	10.2	87 54.3	59.7	128 11.4	05.5	69 05.4	31.7
U	11	237 09.6	359 57.6	11.0	102 56.4	59.7	143 14.2	05.5	84 07.8	31.7
R	12	252 12.1	14 56.8	S19 11.7	117 58.6	N19 59.8	158 17.0	N23 05.5	99 10.2	N12 31.7
D	13	267 14.5	29 56.0	12.5	133 00.7	59.8	173 19.7	05.5	114 12.6	31.7
A	14	282 17.0	44 55.3	13.3	148 02.8	59.8	188 22.5	05.5	129 15.1	31.7
Y	15	297 19.4	59 54.5	·· 14.0	163 05.0	·· 59.8	203 25.3	·· 05.5	144 17.5	·· 31.7
	16	312 21.9	74 53.8	14.8	178 07.1	59.8	218 28.1	05.5	159 19.9	31.7
	17	327 24.4	89 53.0	15.5	193 09.3	59.9	233 30.9	05.6	174 22.4	31.7
	18	342 26.8	104 52.2	S19 16.3	208 11.4	N19 59.9	248 33.7	N23 05.6	189 24.8	N12 31.7
	19	357 29.3	119 51.4	17.0	223 13.5	59.9	263 36.4	05.6	204 27.2	31.7
	20	12 31.8	134 50.7	17.8	238 15.7	19 59.9	278 39.2	05.6	219 29.6	31.7
	21	27 34.2	149 49.9	·· 18.6	253 17.8	20 00.0	293 42.0	·· 05.6	234 32.1	·· 31.7
	22	42 36.7	164 49.1	19.3	268 20.0	00.0	308 44.8	05.6	249 34.5	31.7
	23	57 39.2	179 48.4	20.1	283 22.1	00.0	323 47.6	05.6	264 36.9	31.7
	4 00	72 41.6	194 47.6	S19 20.8	298 24.3	N20 00.0	338 50.4	N23 05.6	279 39.3	N12 31.7
	01	87 44.1	209 46.8	21.6	313 26.4	00.1	353 53.1	05.7	294 41.8	31.6
	02	102 46.6	224 46.1	22.3	328 28.6	00.1	8 55.9	05.7	309 44.2	31.6
	03	117 49.0	239 45.3	·· 23.1	343 30.7	·· 00.1	23 58.7	·· 05.7	324 46.6	·· 31.6
	04	132 51.5	254 44.5	23.8	358 32.9	00.1	39 01.5	05.7	339 49.0	31.6
	05	147 53.9	269 43.7	24.6	13 35.0	00.2	54 04.3	05.7	354 51.5	31.6
	06	162 56.4	284 43.0	S19 25.3	28 37.2	N20 00.2	69 07.1	N23 05.7	9 53.9	N12 31.6
	07	177 58.9	299 42.2	26.0	43 39.4	00.2	84 09.9	05.7	24 56.3	31.6
	08	193 01.3	314 41.4	26.8	58 41.5	00.2	99 12.6	05.7	39 58.8	31.6
S	09	208 03.8	329 40.6	·· 27.5	73 43.7	·· 00.3	114 15.4	·· 05.8	55 01.2	·· 31.6
U	10	223 06.3	344 39.9	28.3	88 45.8	00.3	129 18.2	05.8	70 03.6	31.6
N	11	238 08.7	359 39.1	29.0	103 48.0	00.3	144 21.0	05.8	85 06.0	31.6
D	12	253 11.2	14 38.3	S19 29.8	118 50.2	N20 00.4	159 23.8	N23 05.8	100 08.5	N12 31.6
A	13	268 13.7	29 37.5	30.5	133 52.3	00.4	174 26.6	05.8	115 10.9	31.6
Y	14	283 16.1	44 36.8	31.2	148 54.5	00.4	189 29.4	05.8	130 13.3	31.6
	15	298 18.6	59 36.0	·· 32.0	163 56.7	·· 00.4	204 32.1	·· 05.8	145 15.8	·· 31.6
	16	313 21.1	74 35.2	32.7	178 58.8	00.5	219 34.9	05.8	160 18.2	31.6
	17	328 23.5	89 34.4	33.4	194 01.0	00.5	234 37.7	05.9	175 20.6	31.6
	18	343 26.0	104 33.6	S19 34.2	209 03.2	N20 00.5	249 40.5	N23 05.9	190 23.1	N12 31.6
	19	358 28.4	119 32.9	34.9	224 05.3	00.6	264 43.3	05.9	205 25.5	31.6
	20	13 30.9	134 32.1	35.6	239 07.5	00.6	279 46.1	05.9	220 27.9	31.6
	21	28 33.4	149 31.3	·· 36.4	254 09.7	·· 00.6	294 48.9	·· 05.9	235 30.3	·· 31.6
	22	43 35.8	164 30.5	37.1	269 11.9	00.7	309 51.7	05.9	250 32.8	31.6
	23	58 38.3	179 29.7	37.8	284 14.0	00.7	324 54.5	05.9	265 35.2	31.6
	5 00	73 40.8	194 28.9	S19 38.6	299 16.2	N20 00.7	339 57.2	N23 05.9	280 37.6	N12 31.6
	01	88 43.2	209 28.2	39.3	314 18.4	00.8	355 00.0	06.0	295 40.1	31.6
	02	103 45.7	224 27.4	40.0	329 20.6	00.8	10 02.8	06.0	310 42.5	31.6
	03	118 48.2	239 26.6	·· 40.7	344 22.8	·· 00.8	25 05.6	·· 06.0	325 44.9	·· 31.6
	04	133 50.6	254 25.8	41.5	359 24.9	00.9	40 08.4	06.0	340 47.4	31.6
	05	148 53.1	269 25.0	42.2	14 27.1	00.9	55 11.2	06.0	355 49.8	31.6
	06	163 55.5	284 24.2	S19 42.9	29 29.3	N20 00.9	70 14.0	N23 06.0	10 52.2	N12 31.6
	07	178 58.0	299 23.5	43.6	44 31.5	01.0	85 16.8	06.0	25 54.7	31.6
	08	194 00.5	314 22.7	44.4	59 33.7	01.0	100 19.6	06.0	40 57.1	31.6
M	09	209 02.9	329 21.9	·· 45.1	74 35.9	·· 01.1	115 22.4	·· 06.1	55 59.5	·· 31.6
O	10	224 05.4	344 21.1	45.8	89 38.1	01.1	130 25.1	06.1	71 02.0	31.6
N	11	239 07.9	359 20.3	46.5	104 40.3	01.1	145 27.9	06.1	86 04.4	31.6
D	12	254 10.3	14 19.5	S19 47.2	119 42.5	N20 01.2	160 30.7	N23 06.1	101 06.8	N12 31.6
A	13	269 12.8	29 18.7	48.0	134 44.6	01.2	175 33.5	06.1	116 09.3	31.6
Y	14	284 15.3	44 17.9	48.7	149 46.8	01.2	190 36.3	06.1	131 11.7	31.6
	15	299 17.7	59 17.1	·· 49.4	164 49.0	·· 01.3	205 39.1	·· 06.1	146 14.1	·· 31.6
	16	314 20.2	74 16.3	50.1	179 51.2	01.3	220 41.9	06.1	161 16.6	31.6
	17	329 22.7	89 15.6	50.8	194 53.4	01.4	235 44.7	06.2	176 19.0	31.6
	18	344 25.1	104 14.8	S19 51.5	209 55.6	N20 01.4	250 47.5	N23 06.2	191 21.4	N12 31.6
	19	359 27.6	119 14.0	52.2	224 57.8	01.4	265 50.3	06.2	206 23.9	31.6
	20	14 30.0	134 13.2	52.9	240 00.1	01.5	280 53.1	06.2	221 26.3	31.6
	21	29 32.5	149 12.4	·· 53.7	255 02.3	·· 01.5	295 55.9	·· 06.2	236 28.7	·· 31.6
	22	44 35.0	164 11.6	54.4	270 04.5	01.6	310 58.7	06.2	251 31.2	31.6
	23	59 37.4	179 10.8	55.1	285 06.7	01.6	326 01.5	06.2	266 33.6	31.6
	Mer. Pass.	h m 19 06.1	*v* −0.8	*d* 0.7	*v* 2.2	*d* 0.0	*v* 2.8	*d* 0.0	*v* 2.4	*d* 0.0

STARS Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 38.3	S40 23.7
Achernar	335 46.4	S57 21.2
Acrux	173 39.5	S62 58.3
Adhara	255 33.3	S28 56.5
Aldebaran	291 19.8	N16 27.9
Alioth	166 44.6	N56 04.6
Alkaid	153 20.4	N49 25.3
Al Na'ir	28 17.5	S47 04.2
Alnilam	276 13.2	S 1 13.0
Alphard	218 22.3	S 8 33.8
Alphecca	126 34.1	N26 47.4
Alpheratz	358 11.1	N28 58.3
Altair	62 34.6	N 8 48.8
Ankaa	353 42.0	S42 25.7
Antares	112 59.5	S26 22.9
Arcturus	146 20.5	N19 17.8
Atria	108 26.0	S68 59.2
Avior	234 28.5	S59 26.2
Bellatrix	279 00.4	N 6 19.7
Betelgeuse	271 30.0	N 7 24.1
Canopus	264 07.5	S52 41.0
Capella	281 13.6	N45 58.5
Deneb	49 50.0	N45 12.4
Denebola	183 01.1	N14 41.7
Diphda	349 22.6	S18 06.5
Dubhe	194 24.6	N61 51.9
Elnath	278 46.1	N28 35.3
Eltanin	90 59.1	N51 29.7
Enif	34 13.5	N 9 46.6
Fomalhaut	15 53.5	S29 44.4
Gacrux	172 31.0	S56 59.1
Gienah	176 20.0	S17 25.0
Hadar	149 26.4	S60 15.7
Hamal	328 30.8	N23 21.6
Kaus Aust.	84 19.7	S34 23.7
Kochab	137 20.2	N74 14.7
Markab	14 05.0	N15 05.4
Menkar	314 42.8	N 4 00.2
Menkent	148 39.5	S36 15.5
Miaplacidus	221 44.8	S69 37.4
Mirfak	309 18.3	N49 47.0
Nunki	76 31.9	S26 19.4
Peacock	54 01.8	S56 48.5
Pollux	244 00.2	N28 04.6
Procyon	245 27.5	N 5 16.8
Rasalhague	96 31.7	N12 34.7
Regulus	208 12.0	N12 04.4
Rigel	281 37.5	S 8 13.7
Rigil Kent.	140 28.9	S60 44.4
Sabik	102 43.6	S15 41.7
Schedar	350 10.8	N56 25.3
Shaula	96 58.7	S37 05.2
Sirius	258 57.1	S16 41.2
Spica	158 59.7	S11 02.7
Suhail	223 11.9	S43 20.5
Vega	80 57.5	N38 46.0
Zuben'ubi	137 35.4	S15 56.9

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	122 06.0	11 01
Mars	225 42.7	4 06
Jupiter	266 08.7	1 24
Saturn	206 57.7	5 21

	G.M.T.	SUN G.H.A.	SUN Dec.	MOON G.H.A.	MOON v	MOON Dec.	MOON d	MOON H.P.
	d h	° ′	° ′	° ′	′	° ′	′	′
	3 00	182 35.4	S22 03.1	280 24.3	13.4	N 8 03.1	8.9	55.6
	01	197 35.2	03.5	294 56.7	13.4	7 54.2	9.1	55.6
	02	212 34.9	03.8	309 29.1	13.4	7 45.1	9.0	55.7
	03	227 34.7	·· 04.2	324 01.5	13.3	7 36.1	9.1	55.7
	04	242 34.4	04.5	338 33.8	13.4	7 27.0	9.2	55.7
	05	257 34.2	04.9	353 06.2	13.3	7 17.8	9.1	55.8
	06	272 33.9	S22 05.2	7 38.5	13.4	N 7 08.7	9.3	55.8
	07	287 33.7	05.6	22 10.9	13.3	6 59.4	9.2	55.8
S	08	302 33.4	06.0	36 43.2	13.3	6 50.2	9.4	55.8
A	09	317 33.2	·· 06.3	51 15.5	13.3	6 40.8	9.3	55.9
T	10	332 33.0	06.7	65 47.8	13.2	6 31.5	9.4	55.9
U	11	347 32.7	07.0	80 20.0	13.3	6 22.1	9.4	55.9
R	12	2 32.5	S22 07.4	94 52.3	13.3	N 6 12.7	9.5	56.0
D	13	17 32.2	07.7	109 24.6	13.2	6 03.2	9.5	56.0
A	14	32 32.0	08.1	123 56.8	13.2	5 53.7	9.6	56.0
Y	15	47 31.7	·· 08.4	138 29.0	13.2	5 44.1	9.6	56.1
	16	62 31.5	08.8	153 01.2	13.2	5 34.5	9.6	56.1
	17	77 31.2	09.1	167 33.4	13.1	5 24.9	9.6	56.1
	18	92 31.0	S22 09.5	182 05.5	13.2	N 5 15.3	9.7	56.2
	19	107 30.7	09.8	196 37.7	13.1	5 05.6	9.8	56.2
	20	122 30.5	10.1	211 09.8	13.1	4 55.8	9.7	56.2
	21	137 30.2	·· 10.5	225 41.9	13.1	4 46.1	9.8	56.3
	22	152 30.0	10.8	240 14.0	13.0	4 36.3	9.9	56.3
	23	167 29.7	11.2	254 46.0	13.1	4 26.4	9.8	56.3
	4 00	182 29.5	S22 11.5	269 18.1	13.0	N 4 16.6	9.9	56.4
	01	197 29.2	11.9	283 50.1	13.0	4 06.7	9.9	56.4
	02	212 29.0	12.2	298 22.1	12.9	3 56.8	10.0	56.4
	03	227 28.7	·· 12.5	312 54.0	12.9	3 46.8	10.0	56.5
	04	242 28.5	12.9	327 25.9	12.9	3 36.8	10.0	56.5
	05	257 28.2	13.2	341 57.8	12.9	3 26.8	10.0	56.5
	06	272 28.0	S22 13.6	356 29.7	12.9	N 3 16.8	10.1	56.6
	07	287 27.7	13.9	11 01.6	12.8	3 06.7	10.1	56.6
	08	302 27.5	14.2	25 33.4	12.8	2 56.6	10.2	56.6
S	09	317 27.2	·· 14.6	40 05.2	12.7	2 46.4	10.1	56.7
U	10	332 27.0	14.9	54 36.9	12.8	2 36.3	10.2	56.7
N	11	347 26.7	15.2	69 08.7	12.7	2 26.1	10.2	56.7
D	12	2 26.5	S22 15.6	83 40.4	12.6	N 2 15.9	10.2	56.8
A	13	17 26.2	15.9	98 12.0	12.6	2 05.7	10.3	56.8
Y	14	32 25.9	16.2	112 43.6	12.6	1 55.4	10.3	56.9
	15	47 25.7	·· 16.6	127 15.2	12.6	1 45.1	10.3	56.9
	16	62 25.4	16.9	141 46.8	12.5	1 34.8	10.3	56.9
	17	77 25.2	17.2	156 18.3	12.5	1 24.5	10.3	57.0
	18	92 24.9	S22 17.5	170 49.8	12.5	N 1 14.2	10.4	57.0
	19	107 24.7	17.9	185 21.3	12.4	1 03.8	10.4	57.0
	20	122 24.4	18.2	199 52.7	12.3	0 53.4	10.4	57.1
	21	137 24.2	·· 18.5	214 24.0	12.4	0 43.0	10.4	57.1
	22	152 23.9	18.9	228 55.4	12.2	0 32.6	10.4	57.2
	23	167 23.6	19.2	243 26.6	12.3	0 22.2	10.5	57.2
	5 00	182 23.4	S22 19.5	257 57.9	12.2	N 0 11.7	10.4	57.2
	01	197 23.1	19.8	272 29.1	12.2	N 0 01.3	10.5	57.3
	02	212 22.9	20.1	287 00.3	12.1	S 0 09.2	10.5	57.3
	03	227 22.6	·· 20.5	301 31.4	12.0	0 19.7	10.5	57.4
	04	242 22.4	20.8	316 02.4	12.1	0 30.2	10.5	57.4
	05	257 22.1	21.1	330 33.5	11.9	0 40.7	10.6	57.4
	06	272 21.8	S22 21.4	345 04.4	12.0	S 0 51.3	10.5	57.5
	07	287 21.6	21.8	359 35.4	11.9	1 01.8	10.6	57.5
	08	302 21.3	22.1	14 06.3	11.8	1 12.4	10.5	57.5
M	09	317 21.1	·· 22.4	28 37.1	11.8	1 22.9	10.6	57.6
O	10	332 20.8	22.7	43 07.9	11.7	1 33.5	10.6	57.6
N	11	347 20.6	23.0	57 38.6	11.7	1 44.1	10.6	57.7
D	12	2 20.3	S22 23.3	72 09.3	11.6	S 1 54.7	10.6	57.7
A	13	17 20.0	23.6	86 39.9	11.6	2 05.3	10.5	57.7
Y	14	32 19.8	24.0	101 10.5	11.5	2 15.8	10.6	57.8
	15	47 19.5	·· 24.3	115 41.0	11.5	2 26.4	10.6	57.8
	16	62 19.3	24.6	130 11.5	11.4	2 37.0	10.6	57.9
	17	77 19.0	24.9	144 41.9	11.4	2 47.6	10.7	57.9
	18	92 18.7	S22 25.2	159 12.3	11.3	S 2 58.3	10.6	57.9
	19	107 18.5	25.5	173 42.6	11.2	3 08.9	10.6	58.0
	20	122 18.2	25.8	188 12.8	11.2	3 19.5	10.6	58.0
	21	137 17.9	·· 26.1	202 43.0	11.1	3 30.1	10.6	58.1
	22	152 17.7	26.4	217 13.1	11.1	3 40.7	10.5	58.1
	23	167 17.4	26.7	231 43.2	11.0	3 51.2	10.6	58.2
		S.D. 16.3	d 0.3	S.D. 15.2		15.5		15.7

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 3	Moonrise 4	Moonrise 5	Moonrise 6
°	h m	h m	h m	h m	h m	h m	h m
N 72	07 59	10 03	■	23 08	24 51	00 51	02 38
N 70	07 41	09 20	■	23 14	24 51	00 51	02 32
68	07 28	08 51	10 55	23 19	24 51	00 51	02 26
66	07 16	08 30	09 57	23 23	24 51	00 51	02 21
64	07 06	08 12	09 24	23 27	24 51	00 51	02 18
62	06 58	07 58	09 00	23 30	24 50	00 50	02 14
60	06 50	07 45	08 41	23 33	24 50	00 50	02 11
N 58	06 43	07 35	08 25	23 35	24 50	00 50	02 09
56	06 37	07 25	08 11	23 37	24 50	00 50	02 07
54	06 32	07 17	08 00	23 39	24 50	00 50	02 05
52	06 27	07 10	07 50	23 41	24 50	00 50	02 03
50	06 22	07 03	07 40	23 42	24 50	00 50	02 01
45	06 11	06 48	07 21	23 46	24 50	00 50	01 57
N 40	06 02	06 35	07 05	23 49	24 50	00 50	01 54
35	05 53	06 24	06 52	23 51	24 50	00 50	01 52
30	05 45	06 14	06 40	23 53	24 50	00 50	01 50
20	05 29	05 57	06 20	23 57	24 50	00 50	01 46
N 10	05 14	05 40	06 03	24 00	00 00	00 50	01 42
0	04 58	05 24	05 47	24 03	00 03	00 50	01 39
S 10	04 40	05 07	05 30	24 06	00 06	00 50	01 36
20	04 19	04 48	05 12	24 10	00 10	00 50	01 33
30	03 51	04 24	04 51	24 14	00 14	00 50	01 29
35	03 34	04 10	04 39	24 16	00 16	00 51	01 27
40	03 12	03 53	04 25	24 18	00 18	00 51	01 24
45	02 44	03 32	04 08	24 21	00 21	00 51	01 22
S 50	02 03	03 04	03 47	24 24	00 24	00 51	01 18
52	01 40	02 50	03 37	00 01	00 26	00 51	01 17
54	01 07	02 34	03 26	00 04	00 28	00 51	01 15
56	////	02 15	03 13	00 08	00 30	00 51	01 13
58	////	01 50	02 58	00 12	00 32	00 51	01 11
S 60	////	01 15	02 40	00 16	00 34	00 51	01 09

Lat.	Sunset	Twilight Civil	Twilight Naut.	Moonset 3	Moonset 4	Moonset 5	Moonset 6
°	h m	h m	h m	h m	h m	h m	h m
N 72	■	13 36	15 41	12 57	12 51	12 46	12 40
N 70	■	14 20	15 58	12 49	12 49	12 49	12 49
68	12 45	14 49	16 12	12 42	12 47	12 51	12 56
66	13 43	15 10	16 24	12 36	12 45	12 53	13 03
64	14 16	15 28	16 34	12 31	12 43	12 55	13 08
62	14 40	15 42	16 42	12 27	12 42	12 56	13 12
60	15 00	15 55	16 50	12 23	12 41	12 58	13 16
N 58	15 15	16 05	16 57	12 20	12 39	12 59	13 20
56	15 29	16 15	17 03	12 17	12 38	13 00	13 23
54	15 40	16 23	17 08	12 14	12 38	13 01	13 26
52	15 51	16 31	17 14	12 12	12 37	13 02	13 29
50	16 00	16 37	17 18	12 10	12 36	13 03	13 31
45	16 19	16 52	17 29	12 05	12 34	13 04	13 36
N 40	16 35	17 05	17 39	12 01	12 33	13 06	13 40
35	16 48	17 16	17 47	11 57	12 32	13 07	13 44
30	17 00	17 26	17 56	11 54	12 31	13 08	13 47
20	17 20	17 44	18 11	11 49	12 29	13 10	13 53
N 10	17 37	18 00	18 26	11 44	12 27	13 12	13 58
0	17 54	18 16	18 42	11 39	12 26	13 13	14 03
S 10	18 11	18 33	19 00	11 35	12 24	13 15	14 08
20	18 29	18 53	19 22	11 30	12 22	13 16	14 13
30	18 49	19 17	19 49	11 24	12 20	13 18	14 19
35	19 02	19 31	20 07	11 21	12 19	13 19	14 22
40	19 16	19 48	20 29	11 17	12 18	13 21	14 26
45	19 33	20 09	20 57	11 13	12 16	13 22	14 30
S 50	19 54	20 37	21 38	11 08	12 14	13 24	14 36
52	20 04	20 51	22 02	11 05	12 14	13 24	14 38
54	20 15	21 07	22 36	11 03	12 13	13 25	14 41
56	20 28	21 27	////	11 00	12 12	13 26	14 44
58	20 44	21 52	////	10 56	12 10	13 27	14 47
S 60	21 02	22 29	////	10 53	12 09	13 28	14 51

Day	SUN Eqn. of Time 00ʰ	SUN Eqn. of Time 12ʰ	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
	m s	m s	h m	h m	h m	d	
3	10 22	10 10	11 50	05 28	17 51	22	◑
4	09 58	09 46	11 50	06 14	18 38	23	
5	09 34	09 22	11 51	07 02	19 26	24	

	G.M.T.	ARIES	VENUS −3.4		MARS −0.3		JUPITER −2.3		SATURN +0.7		STARS		
		G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	Name	S.H.A.	Dec.
	d h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	° ′
	6 00	74 39.9	194 10.0	S19 55.8	300 08.9	N20 01.7	341 04.2	N23 06.2	281 36.1	N12 31.6	Acamar	315 38.3	S40 23.7
	01	89 42.4	209 09.2	56.5	315 11.1	01.7	356 07.0	06.3	296 38.5	31.6	Achernar	335 46.4	S57 21.2
	02	104 44.8	224 08.4	57.2	330 13.3	01.7	11 09.8	06.3	311 40.9	31.6	Acrux	173 39.4	S62 58.3
	03	119 47.3	239 07.6	·· 57.9	345 15.5	·· 01.8	26 12.6	·· 06.3	326 43.4	·· 31.6	Adhara	255 33.2	S28 56.5
	04	134 49.8	254 06.8	58.6	0 17.7	01.8	41 15.4	06.3	341 45.8	31.6	Aldebaran	291 19.8	N16 27.9
	05	149 52.2	269 06.0	19 59.3	15 19.9	01.9	56 18.2	06.3	356 48.2	31.6			
	06	164 54.7	284 05.2	S20 00.0	30 22.2	N20 01.9	71 21.0	N23 06.3	11 50.7	N12 31.6	Alioth	166 44.6	N56 04.5
	07	179 57.2	299 04.4	00.7	45 24.4	02.0	86 23.8	06.3	26 53.1	31.6	Alkaid	153 20.4	N49 25.3
	08	194 59.6	314 03.6	01.4	60 26.6	02.0	101 26.6	06.3	41 55.5	31.6	Al Na'ir	28 17.5	S47 04.2
T	09	210 02.1	329 02.8	·· 02.1	75 28.8	·· 02.1	116 29.4	·· 06.4	56 58.0	·· 31.6	Alnilam	276 13.2	S 1 13.0
U	10	225 04.5	344 02.0	02.8	90 31.0	02.1	131 32.2	06.4	72 00.4	31.6	Alphard	218 22.3	S 8 33.8
E	11	240 07.0	359 01.2	03.5	105 33.3	02.1	146 35.0	06.4	87 02.9	31.6			
S	12	255 09.5	14 00.4	S20 04.2	120 35.5	N20 02.2	161 37.8	N23 06.4	102 05.3	N12 31.6	Alphecca	126 34.1	N26 47.4
D	13	270 11.9	28 59.6	04.9	135 37.7	02.2	176 40.6	06.4	117 07.7	31.6	Alpheratz	358 11.1	N28 58.3
A	14	285 14.4	43 58.8	05.6	150 39.9	02.3	191 43.4	06.4	132 10.2	31.6	Altair	62 34.6	N 8 48.8
Y	15	300 16.9	58 58.0	·· 06.2	165 42.2	·· 02.3	206 46.2	·· 06.4	147 12.6	·· 31.6	Ankaa	353 42.0	S42 25.7
	16	315 19.3	73 57.2	06.9	180 44.4	02.4	221 49.0	06.4	162 15.1	31.6	Antares	112 59.5	S26 22.9
	17	330 21.8	88 56.4	07.6	195 46.6	02.4	236 51.8	06.5	177 17.5	31.6			
	18	345 24.3	103 55.6	S20 08.3	210 48.9	N20 02.5	251 54.6	N23 06.5	192 19.9	N12 31.6	Arcturus	146 20.5	N19 17.8
	19	0 26.7	118 54.8	09.0	225 51.1	02.5	266 57.4	06.5	207 22.4	31.6	Atria	108 26.0	S68 59.2
	20	15 29.2	133 54.0	09.7	240 53.3	02.6	282 00.2	06.5	222 24.8	31.6	Avior	234 28.5	S59 26.2
	21	30 31.6	148 53.2	·· 10.4	255 55.6	·· 02.6	297 03.0	·· 06.5	237 27.3	·· 31.6	Bellatrix	279 00.4	N 6 19.7
	22	45 34.1	163 52.4	11.1	270 57.8	02.7	312 05.8	06.5	252 29.7	31.6	Betelgeuse	271 30.0	N 7 24.1
	23	60 36.6	178 51.6	11.7	286 00.0	02.7	327 08.6	06.5	267 32.1	31.6			
	7 00	75 39.0	193 50.8	S20 12.4	301 02.3	N20 02.8	342 11.4	N23 06.5	282 34.6	N12 31.6	Canopus	264 07.5	S52 41.0
	01	90 41.5	208 50.0	13.1	316 04.5	02.8	357 14.2	06.6	297 37.0	31.6	Capella	281 13.6	N45 58.5
	02	105 44.0	223 49.2	13.8	331 06.8	02.9	12 17.0	06.6	312 39.5	31.6	Deneb	49 50.0	N45 12.4
	03	120 46.4	238 48.3	·· 14.5	346 09.0	·· 02.9	27 19.8	·· 06.6	327 41.9	·· 31.6	Denebola	183 01.1	N14 41.6
	04	135 48.9	253 47.5	15.1	1 11.3	03.0	42 22.6	06.6	342 44.3	31.6	Diphda	349 22.6	S18 06.5
	05	150 51.4	268 46.7	15.8	16 13.5	03.1	57 25.4	06.6	357 46.8	31.6			
	06	165 53.8	283 45.9	S20 16.5	31 15.8	N20 03.1	72 28.2	N23 06.6	12 49.2	N12 31.6	Dubhe	194 24.6	N61 51.9
W	07	180 56.3	298 45.1	17.2	46 18.0	03.2	87 31.0	06.6	27 51.7	31.6	Elnath	278 46.1	N28 35.3
E	08	195 58.8	313 44.3	17.8	61 20.3	03.2	102 33.8	06.6	42 54.1	31.6	Eltanin	90 59.1	N51 29.7
D	09	211 01.2	328 43.5	·· 18.5	76 22.5	·· 03.3	117 36.6	·· 06.7	57 56.5	·· 31.6	Enif	34 13.5	N 9 46.6
N	10	226 03.7	343 42.7	19.2	91 24.8	03.3	132 39.4	06.7	72 59.0	31.6	Fomalhaut	15 53.6	S29 44.5
E	11	241 06.1	358 41.9	19.9	106 27.0	03.4	147 42.2	06.7	88 01.4	31.6			
S	12	256 08.6	13 41.0	S20 20.5	121 29.3	N20 03.4	162 45.0	N23 06.7	103 03.9	N12 31.6	Gacrux	172 30.9	S56 59.1
D	13	271 11.1	28 40.2	21.2	136 31.5	03.5	177 47.8	06.7	118 06.3	31.6	Gienah	176 20.0	S17 25.0
A	14	286 13.5	43 39.4	21.9	151 33.8	03.5	192 50.6	06.7	133 08.8	31.6	Hadar	149 26.4	S60 15.7
Y	15	301 16.0	58 38.6	·· 22.5	166 36.0	·· 03.6	207 53.4	·· 06.7	148 11.2	·· 31.6	Hamal	328 30.8	N23 21.6
	16	316 18.5	73 37.8	23.2	181 38.3	03.7	222 56.2	06.7	163 13.6	31.6	Kaus Aust.	84 19.7	S34 23.7
	17	331 20.9	88 37.0	23.9	196 40.6	03.7	237 59.0	06.8	178 16.1	31.6			
	18	346 23.4	103 36.2	S20 24.5	211 42.8	N20 03.8	253 01.8	N23 06.8	193 18.5	N12 31.6	Kochab	137 20.2	N74 14.7
	19	1 25.9	118 35.3	25.2	226 45.1	03.8	268 04.6	06.8	208 21.0	31.6	Markab	14 05.0	N15 05.4
	20	16 28.3	133 34.5	25.9	241 47.4	03.9	283 07.4	06.8	223 23.4	31.6	Menkar	314 42.8	N 4 00.2
	21	31 30.8	148 33.7	·· 26.5	256 49.6	·· 04.0	298 10.2	·· 06.8	238 25.9	·· 31.6	Menkent	148 39.5	S36 15.5
	22	46 33.3	163 32.9	27.2	271 51.9	04.0	313 13.0	06.8	253 28.3	31.6	Miaplacidus	221 44.7	S69 37.4
	23	61 35.7	178 32.1	27.8	286 54.2	04.1	328 15.8	06.8	268 30.8	31.6			
	8 00	76 38.2	193 31.3	S20 28.5	301 56.4	N20 04.1	343 18.6	N23 06.8	283 33.2	N12 31.6	Mirfak	309 18.3	N49 47.1
	01	91 40.6	208 30.4	29.1	316 58.7	04.2	358 21.4	06.9	298 35.6	31.6	Nunki	76 31.9	S26 19.4
	02	106 43.1	223 29.6	29.8	332 01.0	04.3	13 24.2	06.9	313 38.1	31.6	Peacock	54 01.8	S56 48.5
	03	121 45.6	238 28.8	·· 30.5	347 03.3	·· 04.3	28 27.0	·· 06.9	328 40.5	·· 31.6	Pollux	244 00.2	N28 04.6
	04	136 48.0	253 28.0	31.1	2 05.5	04.4	43 29.8	06.9	343 43.0	31.6	Procyon	245 27.5	N 5 16.8
	05	151 50.5	268 27.2	31.8	17 07.8	04.5	58 32.6	06.9	358 45.4	31.6			
	06	166 53.0	283 26.3	S20 32.4	32 10.1	N20 04.5	73 35.4	N23 06.9	13 47.9	N12 31.6	Rasalhague	96 31.7	N12 34.7
	07	181 55.4	298 25.5	33.1	47 12.4	04.6	88 38.2	06.9	28 50.3	31.7	Regulus	208 11.9	N12 04.4
T	08	196 57.9	313 24.7	33.7	62 14.7	04.6	103 41.0	06.9	43 52.8	31.7	Rigel	281 37.5	S 8 13.7
H	09	212 00.4	328 23.9	·· 34.4	77 16.9	·· 04.7	118 43.8	·· 07.0	58 55.2	·· 31.7	Rigil Kent.	140 28.8	S60 44.4
U	10	227 02.8	343 23.0	35.0	92 19.2	04.8	133 46.6	07.0	73 57.7	31.7	Sabik	102 43.6	S15 41.7
R	11	242 05.3	358 22.2	35.7	107 21.5	04.8	148 49.4	07.0	89 00.1	31.7			
S	12	257 07.7	13 21.4	S20 36.3	122 23.8	N20 04.9	163 52.2	N23 07.0	104 02.6	N12 31.7	Schedar	350 10.8	N56 25.3
D	13	272 10.2	28 20.6	37.0	137 26.1	05.0	178 55.0	07.0	119 05.0	31.7	Shaula	96 58.7	S37 05.2
A	14	287 12.7	43 19.7	37.6	152 28.4	05.0	193 57.8	07.0	134 07.4	31.7	Sirius	258 57.0	S16 41.2
Y	15	302 15.1	58 18.9	·· 38.2	167 30.7	·· 05.1	209 00.6	·· 07.0	149 09.9	·· 31.7	Spica	158 59.7	S11 02.7
	16	317 17.6	73 18.1	38.9	182 33.0	05.2	224 03.4	07.0	164 12.3	31.7	Suhail	223 11.9	S43 20.5
	17	332 20.1	88 17.3	39.5	197 35.3	05.2	239 06.3	07.1	179 14.8	31.7			
	18	347 22.5	103 16.4	S20 40.2	212 37.6	N20 05.3	254 09.1	N23 07.1	194 17.2	N12 31.7	Vega	80 57.5	N38 46.0
	19	2 25.0	118 15.6	40.8	227 39.9	05.4	269 11.9	07.1	209 19.7	31.7	Zuben'ubi	137 35.4	S15 56.9
	20	17 27.5	133 14.8	41.4	242 42.2	05.4	284 14.7	07.1	224 22.1	31.7		S.H.A.	Mer. Pass.
	21	32 29.9	148 13.9	·· 42.1	257 44.5	·· 05.5	299 17.5	·· 07.1	239 24.6	·· 31.7		° ′	h m
	22	47 32.4	163 13.1	42.7	272 46.8	05.6	314 20.3	07.1	254 27.0	31.7	Venus	118 11.7	11 05
	23	62 34.9	178 12.3	43.3	287 49.1	05.6	329 23.1	07.1	269 29.5	31.7	Mars	225 23.2	3 55
	Mer. Pass.	h m 18 54.3	*v* −0.8	*d* 0.7	*v* 2.3	*d* 0.1	*v* 2.8	*d* 0.0	*v* 2.4	*d* 0.0	Jupiter	266 32.3	1 11
											Saturn	206 55.5	5 09

1977 DECEMBER 6, 7, 8 (TUES., WED., THURS.)

G.M.T.	SUN G.H.A.	SUN Dec.	MOON G.H.A.	MOON v	MOON Dec.	MOON d	MOON H.P.
d h	° ′	° ′	° ′	′	° ′	′	′
6 00 TUESDAY	182 17.2	S22 27.1	246 13.2	10.9	S 4 01.8	10.6	58.2
01	197 16.9	27.4	260 43.1	10.9	4 12.4	10.6	58.2
02	212 16.6	27.7	275 13.0	10.8	4 23.0	10.6	58.3
03	227 16.4	·· 28.0	289 42.8	10.8	4 33.6	10.5	58.3
04	242 16.1	28.3	304 12.6	10.7	4 44.1	10.6	58.4
05	257 15.8	28.6	318 42.3	10.6	4 54.7	10.5	58.4
06	272 15.6	S22 28.9	333 11.9	10.5	S 5 05.2	10.5	58.4
07	287 15.3	29.2	347 41.4	10.5	5 15.7	10.6	58.5
08	302 15.1	29.5	2 10.9	10.5	5 26.3	10.5	58.5
09	317 14.8	·· 29.8	16 40.4	10.3	5 36.8	10.4	58.6
10	332 14.5	30.1	31 09.7	10.3	5 47.2	10.5	58.6
11	347 14.3	30.4	45 39.0	10.2	5 57.7	10.5	58.6
12	2 14.0	S22 30.7	60 08.2	10.1	S 6 08.2	10.4	58.7
13	17 13.7	31.0	74 37.3	10.1	6 18.6	10.4	58.7
14	32 13.5	31.3	89 06.4	10.0	6 29.0	10.4	58.8
15	47 13.2	·· 31.6	103 35.4	10.0	6 39.4	10.4	58.8
16	62 12.9	31.8	118 04.4	9.8	6 49.8	10.3	58.8
17	77 12.7	32.1	132 33.2	9.8	7 00.1	10.3	58.9
18	92 12.4	S22 32.4	147 02.0	9.7	S 7 10.4	10.3	58.9
19	107 12.1	32.7	161 30.7	9.6	7 20.7	10.3	59.0
20	122 11.9	33.0	175 59.3	9.6	7 31.0	10.2	59.0
21	137 11.6	·· 33.3	190 27.9	9.5	7 41.2	10.2	59.0
22	152 11.3	33.6	204 56.4	9.4	7 51.4	10.2	59.1
23	167 11.1	33.9	219 24.8	9.3	8 01.6	10.1	59.1
7 00 WEDNESDAY	182 10.8	S22 34.2	233 53.1	9.3	S 8 11.7	10.2	59.2
01	197 10.5	34.5	248 21.4	9.1	8 21.9	10.0	59.2
02	212 10.3	34.7	262 49.5	9.1	8 31.9	10.1	59.2
03	227 10.0	·· 35.0	277 17.6	9.1	8 42.0	10.0	59.3
04	242 09.7	35.3	291 45.7	8.9	8 52.0	10.0	59.3
05	257 09.5	35.6	306 13.6	8.8	9 02.0	9.9	59.4
06	272 09.2	S22 35.9	320 41.4	8.8	S 9 11.9	9.9	59.4
07	287 08.9	36.2	335 09.2	8.7	9 21.8	9.8	59.4
08	302 08.6	36.4	349 36.9	8.6	9 31.6	9.8	59.5
09	317 08.4	·· 36.7	4 04.5	8.6	9 41.4	9.8	59.5
10	332 08.1	37.0	18 32.1	8.4	9 51.2	9.7	59.6
11	347 07.8	37.3	32 59.5	8.4	10 00.9	9.6	59.6
12	2 07.6	S22 37.6	47 26.9	8.3	S10 10.5	9.6	59.6
13	17 07.3	37.8	61 54.2	8.2	10 20.1	9.6	59.7
14	32 07.0	38.1	76 21.4	8.1	10 29.7	9.5	59.7
15	47 06.8	·· 38.4	90 48.5	8.0	10 39.2	9.5	59.7
16	62 06.5	38.7	105 15.5	8.0	10 48.7	9.4	59.8
17	77 06.2	38.9	119 42.5	7.8	10 58.1	9.3	59.8
18	92 05.9	S22 39.2	134 09.3	7.8	S11 07.4	9.3	59.9
19	107 05.7	39.5	148 36.1	7.7	11 16.7	9.2	59.9
20	122 05.4	39.8	163 02.8	7.6	11 25.9	9.2	59.9
21	137 05.1	·· 40.0	177 29.4	7.5	11 35.1	9.1	60.0
22	152 04.8	40.3	191 55.9	7.5	11 44.2	9.1	60.0
23	167 04.6	40.6	206 22.4	7.3	11 53.3	8.9	60.0
8 00 THURSDAY	182 04.3	S22 40.8	220 48.7	7.3	S12 02.2	9.0	60.1
01	197 04.0	41.1	235 15.0	7.2	12 11.2	8.8	60.1
02	212 03.8	41.4	249 41.2	7.1	12 20.0	8.8	60.1
03	227 03.5	·· 41.6	264 07.3	7.0	12 28.8	8.7	60.2
04	242 03.2	41.9	278 33.3	7.0	12 37.5	8.6	60.2
05	257 02.9	42.2	292 59.3	6.8	12 46.1	8.6	60.2
06	272 02.7	S22 42.4	307 25.1	6.8	S12 54.7	8.5	60.3
07	287 02.4	42.7	321 50.9	6.7	13 03.2	8.4	60.3
08	302 02.1	43.0	336 16.6	6.5	13 11.6	8.3	60.3
09	317 01.8	·· 43.2	350 42.1	6.6	13 19.9	8.3	60.4
10	332 01.6	43.5	5 07.7	6.4	13 28.2	8.1	60.4
11	347 01.3	43.8	19 33.1	6.3	13 36.3	8.1	60.4
12	2 01.0	S22 44.0	33 58.4	6.3	S13 44.4	8.0	60.5
13	17 00.7	44.3	48 23.7	6.2	13 52.4	7.9	60.5
14	32 00.5	44.5	62 48.9	6.1	14 00.3	7.9	60.5
15	47 00.2	·· 44.8	77 14.0	6.0	14 08.2	7.7	60.6
16	61 59.9	45.0	91 39.0	5.9	14 15.9	7.7	60.6
17	76 59.6	45.3	106 03.9	5.9	14 23.6	7.6	60.6
18	91 59.3	S22 45.6	120 28.8	5.7	S14 31.2	7.4	60.7
19	106 59.1	45.8	134 53.5	5.7	14 38.6	7.4	60.7
20	121 58.8	46.1	149 18.2	5.6	14 46.0	7.3	60.7
21	136 58.5	·· 46.3	163 42.8	5.6	14 53.3	7.2	60.7
22	151 58.2	46.6	178 07.4	5.4	15 00.5	7.1	60.8
23	166 58.0	46.8	192 31.8	5.4	15 07.6	7.0	60.8
	S.D. 16.3	*d* 0.3	S.D. 16.0		16.2		16.5

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 6	Moonrise 7	Moonrise 8	Moonrise 9
°	h m	h m	h m	h m	h m	h m	h m
N 72	08 06	10 17	■	02 38	04 32	06 36	08 53
N 70	07 48	09 29	■	02 32	04 18	06 10	08 05
68	07 33	08 59	11 18	02 26	04 06	05 50	07 35
66	07 21	08 36	10 07	02 21	03 56	05 35	07 13
64	07 11	08 18	09 31	02 18	03 48	05 22	06 55
62	07 02	08 03	09 06	02 14	03 42	05 11	06 40
60	06 54	07 50	08 46	02 11	03 36	05 02	06 28
N 58	06 47	07 39	08 30	02 09	03 30	04 54	06 18
56	06 41	07 29	08 16	02 07	03 26	04 47	06 08
54	06 35	07 21	08 04	02 05	03 22	04 41	06 00
52	06 30	07 13	07 53	02 03	03 18	04 35	05 53
50	06 25	07 06	07 44	02 01	03 15	04 30	05 47
45	06 14	06 51	07 24	01 57	03 07	04 19	05 33
N 40	06 04	06 38	07 08	01 54	03 01	04 10	05 21
35	05 55	06 27	06 55	01 52	02 56	04 03	05 11
30	05 47	06 17	06 43	01 50	02 51	03 56	05 03
20	05 31	05 58	06 22	01 46	02 44	03 45	04 48
N 10	05 16	05 42	06 05	01 42	02 37	03 35	04 35
0	04 59	05 25	05 48	01 39	02 30	03 25	04 23
S 10	04 41	05 08	05 31	01 36	02 24	03 16	04 12
20	04 19	04 48	05 13	01 33	02 17	03 06	03 59
30	03 51	04 24	04 51	01 29	02 10	02 55	03 45
35	03 33	04 10	04 39	01 27	02 05	02 48	03 37
40	03 11	03 52	04 25	01 24	02 01	02 41	03 27
45	02 42	03 31	04 07	01 22	01 55	02 33	03 16
S 50	02 00	03 02	03 46	01 18	01 48	02 22	03 03
52	01 36	02 48	03 36	01 17	01 45	02 18	02 57
54	01 00	02 32	03 24	01 15	01 42	02 13	02 50
56	////	02 11	03 11	01 13	01 38	02 07	02 43
58	////	01 45	02 55	01 11	01 34	02 01	02 34
S 60	////	01 07	02 36	01 09	01 29	01 54	02 25

Lat.	Sunset	Twilight Civil	Twilight Naut.	Moonset 6	Moonset 7	Moonset 8	Moonset 9
°	h m	h m	h m	h m	h m	h m	h m
N 72	■	13 26	15 37	12 40	12 33	12 25	12 12
N 70	■	14 13	15 55	12 49	12 50	12 53	13 00
68	12 25	14 44	16 09	12 56	13 03	13 13	13 31
66	13 36	15 07	16 21	13 03	13 14	13 30	13 54
64	14 12	15 25	16 32	13 08	13 23	13 44	14 12
62	14 37	15 40	16 41	13 12	13 31	13 55	14 28
60	14 57	15 53	16 48	13 16	13 38	14 05	14 40
N 58	15 13	16 04	16 55	13 20	13 44	14 14	14 51
56	15 27	16 13	17 02	13 23	13 49	14 21	15 01
54	15 39	16 22	17 08	13 26	13 54	14 28	15 09
52	15 49	16 30	17 13	13 29	13 59	14 34	15 17
50	15 59	16 37	17 18	13 31	14 03	14 40	15 24
45	16 19	16 52	17 29	13 36	14 11	14 51	15 39
N 40	16 35	17 05	17 39	13 40	14 18	15 01	15 51
35	16 48	17 16	17 48	13 44	14 25	15 10	16 01
30	17 00	17 26	17 56	13 47	14 30	15 17	16 10
20	17 21	17 44	18 12	13 53	14 40	15 30	16 26
N 10	17 38	18 01	18 27	13 58	14 48	15 42	16 39
0	17 55	18 18	18 44	14 03	14 56	15 52	16 52
S 10	18 12	18 35	19 02	14 08	15 04	16 03	17 05
20	18 30	18 55	19 24	14 13	15 12	16 15	17 19
30	18 52	19 19	19 52	14 19	15 22	16 28	17 35
35	19 04	19 34	20 10	14 22	15 27	16 35	17 44
40	19 19	19 51	20 32	14 26	15 34	16 44	17 54
45	19 36	20 13	21 01	14 30	15 41	16 54	18 06
S 50	19 58	20 41	21 44	14 36	15 50	17 06	18 21
52	20 08	20 55	22 09	14 38	15 54	17 12	18 28
54	20 20	21 12	22 45	14 41	15 59	17 18	18 36
56	20 33	21 33	////	14 44	16 04	17 25	18 45
58	20 49	21 59	////	14 47	16 09	17 33	18 55
S 60	21 08	22 39	////	14 51	16 16	17 42	19 06

Day	SUN Eqn. of Time 00ʰ	SUN Eqn. of Time 12ʰ	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
	m s	m s	h m	h m	h m	d	
6	09 09	08 57	11 51	07 51	20 17	25	
7	08 44	08 31	11 51	08 43	21 10	26	◐
8	08 18	08 05	11 52	09 39	22 08	27	

1977 DECEMBER 9, 10, 11 (FRI., SAT., SUN.)

	G.M.T.	ARIES	VENUS −3.4		MARS −0.3		JUPITER −2.3		SATURN +0.7	
		G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
	d h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
	9 00	77 37.3	193 11.5	S20 44.0	302 51.4	N20 05.7	344 25.9	N23 07.1	284 31.9	N12 31.7
	01	92 39.8	208 10.6	44.6	317 53.7	05.8	359 28.7	07.1	299 34.4	31.7
	02	107 42.2	223 09.8	45.2	332 56.0	05.9	14 31.5	07.2	314 36.8	31.7
	03	122 44.7	238 09.0	·· 45.9	347 58.3	·· 05.9	29 34.3	·· 07.2	329 39.3	·· 31.7
	04	137 47.2	253 08.1	46.5	3 00.6	06.0	44 37.1	07.2	344 41.7	31.7
	05	152 49.6	268 07.3	47.1	18 02.9	06.1	59 39.9	07.2	359 44.2	31.7
	06	167 52.1	283 06.5	S20 47.8	33 05.2	N20 06.1	74 42.7	N23 07.2	14 46.6	N12 31.8
	07	182 54.6	298 05.6	48.4	48 07.5	06.2	89 45.5	07.2	29 49.1	31.8
	08	197 57.0	313 04.8	49.0	63 09.8	06.3	104 48.4	07.2	44 51.5	31.8
F	09	212 59.5	328 04.0	·· 49.6	78 12.2	·· 06.4	119 51.2	·· 07.2	59 54.0	·· 31.8
R	10	228 02.0	343 03.1	50.3	93 14.5	06.4	134 54.0	07.3	74 56.4	31.8
I	11	243 04.4	358 02.3	50.9	108 16.8	06.5	149 56.8	07.3	89 58.9	31.8
D	12	258 06.9	13 01.5	S20 51.5	123 19.1	N20 06.6	164 59.6	N23 07.3	105 01.3	N12 31.8
A	13	273 09.4	28 00.6	52.1	138 21.4	06.7	180 02.4	07.3	120 03.8	31.8
Y	14	288 11.8	42 59.8	52.7	153 23.8	06.7	195 05.2	07.3	135 06.2	31.8
	15	303 14.3	57 59.0	·· 53.4	168 26.1	·· 06.8	210 08.0	·· 07.3	150 08.7	·· 31.8
	16	318 16.7	72 58.1	54.0	183 28.4	06.9	225 10.8	07.3	165 11.1	31.8
	17	333 19.2	87 57.3	54.6	198 30.7	07.0	240 13.6	07.3	180 13.6	31.8
	18	348 21.7	102 56.4	S20 55.2	213 33.1	N20 07.0	255 16.4	N23 07.4	195 16.1	N12 31.8
	19	3 24.1	117 55.6	55.8	228 35.4	07.1	270 19.3	07.4	210 18.5	31.8
	20	18 26.6	132 54.8	56.4	243 37.7	07.2	285 22.1	07.4	225 21.0	31.8
	21	33 29.1	147 53.9	·· 57.0	258 40.1	·· 07.3	300 24.9	·· 07.4	240 23.4	·· 31.8
	22	48 31.5	162 53.1	57.6	273 42.4	07.4	315 27.7	07.4	255 25.9	31.8
	23	63 34.0	177 52.2	58.3	288 44.7	07.4	330 30.5	07.4	270 28.3	31.8
	10 00	78 36.5	192 51.4	S20 58.9	303 47.1	N20 07.5	345 33.3	N23 07.4	285 30.8	N12 31.9
	01	93 38.9	207 50.6	20 59.5	318 49.4	07.6	0 36.1	07.4	300 33.2	31.9
	02	108 41.4	222 49.7	21 00.1	333 51.7	07.7	15 38.9	07.4	315 35.7	31.9
	03	123 43.9	237 48.9	·· 00.7	348 54.1	·· 07.8	30 41.7	·· 07.5	330 38.1	·· 31.9
	04	138 46.3	252 48.0	01.3	3 56.4	07.8	45 44.5	07.5	345 40.6	31.9
	05	153 48.8	267 47.2	01.9	18 58.8	07.9	60 47.4	07.5	0 43.0	31.9
	06	168 51.2	282 46.3	S21 02.5	34 01.1	N20 08.0	75 50.2	N23 07.5	15 45.5	N12 31.9
	07	183 53.7	297 45.5	03.1	49 03.5	08.1	90 53.0	07.5	30 48.0	31.9
S	08	198 56.2	312 44.6	03.7	64 05.8	08.2	105 55.8	07.5	45 50.4	31.9
A	09	213 58.6	327 43.8	·· 04.3	79 08.2	·· 08.3	120 58.6	·· 07.5	60 52.9	·· 31.9
T	10	229 01.1	342 43.0	04.9	94 10.5	08.3	136 01.4	07.5	75 55.3	31.9
U	11	244 03.6	357 42.1	05.5	109 12.9	08.4	151 04.2	07.6	90 57.8	31.9
R	12	259 06.0	12 41.3	S21 06.1	124 15.2	N20 08.5	166 07.0	N23 07.6	106 00.2	N12 31.9
D	13	274 08.5	27 40.4	06.7	139 17.6	08.6	181 09.8	07.6	121 02.7	31.9
A	14	289 11.0	42 39.6	07.3	154 19.9	08.7	196 12.7	07.6	136 05.1	32.0
Y	15	304 13.4	57 38.7	·· 07.9	169 22.3	·· 08.8	211 15.5	·· 07.6	151 07.6	·· 32.0
	16	319 15.9	72 37.9	08.5	184 24.6	08.8	226 18.3	07.6	166 10.1	32.0
	17	334 18.3	87 37.0	09.0	199 27.0	08.9	241 21.1	07.6	181 12.5	32.0
	18	349 20.8	102 36.2	S21 09.6	214 29.4	N20 09.0	256 23.9	N23 07.6	196 15.0	N12 32.0
	19	4 23.3	117 35.3	10.2	229 31.7	09.1	271 26.7	07.6	211 17.4	32.0
	20	19 25.7	132 34.5	10.8	244 34.1	09.2	286 29.5	07.7	226 19.9	32.0
	21	34 28.2	147 33.6	·· 11.4	259 36.4	·· 09.3	301 32.4	·· 07.7	241 22.3	·· 32.0
	22	49 30.7	162 32.8	12.0	274 38.8	09.4	316 35.2	07.7	256 24.8	32.0
	23	64 33.1	177 31.9	12.6	289 41.2	09.5	331 38.0	07.7	271 27.3	32.0
	11 00	79 35.6	192 31.1	S21 13.2	304 43.5	N20 09.5	346 40.8	N23 07.7	286 29.7	N12 32.0
	01	94 38.1	207 30.2	13.7	319 45.9	09.6	1 43.6	07.7	301 32.2	32.0
	02	109 40.5	222 29.4	14.3	334 48.3	09.7	16 46.4	07.7	316 34.6	32.0
	03	124 43.0	237 28.5	·· 14.9	349 50.7	·· 09.8	31 49.2	·· 07.7	331 37.1	·· 32.1
	04	139 45.5	252 27.7	15.5	4 53.0	09.9	46 52.1	07.8	346 39.6	32.1
	05	154 47.9	267 26.8	16.0	19 55.4	10.0	61 54.9	07.8	1 42.0	32.1
	06	169 50.4	282 25.9	S21 16.6	34 57.8	N20 10.1	76 57.7	N23 07.8	16 44.5	N12 32.1
	07	184 52.8	297 25.1	17.2	50 00.2	10.2	92 00.5	07.8	31 46.9	32.1
	08	199 55.3	312 24.2	17.8	65 02.6	10.3	107 03.3	07.8	46 49.4	32.1
S	09	214 57.8	327 23.4	·· 18.3	80 04.9	·· 10.4	122 06.1	·· 07.8	61 51.9	·· 32.1
U	10	230 00.2	342 22.5	18.9	95 07.3	10.5	137 08.9	07.8	76 54.3	32.1
N	11	245 02.7	357 21.7	19.5	110 09.7	10.6	152 11.8	07.8	91 56.8	32.1
D	12	260 05.2	12 20.8	S21 20.1	125 12.1	N20 10.6	167 14.6	N23 07.8	106 59.2	N12 32.1
A	13	275 07.6	27 19.9	20.6	140 14.5	10.7	182 17.4	07.9	122 01.7	32.1
Y	14	290 10.1	42 19.1	21.2	155 16.9	10.8	197 20.2	07.9	137 04.2	32.1
	15	305 12.6	57 18.2	·· 21.8	170 19.3	·· 10.9	212 23.0	·· 07.9	152 06.6	·· 32.2
	16	320 15.0	72 17.4	22.3	185 21.6	11.0	227 25.8	07.9	167 09.1	32.2
	17	335 17.5	87 16.5	22.9	200 24.0	11.1	242 28.7	07.9	182 11.5	32.2
	18	350 20.0	102 15.6	S21 23.5	215 26.4	N20 11.2	257 31.5	N23 07.9	197 14.0	N12 32.2
	19	5 22.4	117 14.8	24.0	230 28.8	11.3	272 34.3	07.9	212 16.5	32.2
	20	20 24.9	132 13.9	24.6	245 31.2	11.4	287 37.1	07.9	227 18.9	32.2
	21	35 27.3	147 13.1	·· 25.1	260 33.6	·· 11.5	302 39.9	·· 08.0	242 21.4	·· 32.2
	22	50 29.8	162 12.2	25.7	275 36.0	11.6	317 42.7	08.0	257 23.9	32.2
	23	65 32.3	177 11.3	26.3	290 38.4	11.7	332 45.5	08.0	272 26.3	32.2
	Mer. Pass.	h m 18 42.5	v −0.8	d 0.6	v 2.4	d 0.1	v 2.8	d 0.0	v 2.5	d 0.0

STARS

Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 38.3	S40 23.8
Achernar	335 46.4	S57 21.2
Acrux	173 39.4	S62 58.3
Adhara	255 33.2	S28 56.5
Aldebaran	291 19.8	N16 27.9
Alioth	166 44.5	N56 04.5
Alkaid	153 20.4	N49 25.2
Al Na'ir	28 17.5	S47 04.2
Alnilam	276 13.2	S 1 13.0
Alphard	218 22.2	S 8 33.8
Alphecca	126 34.1	N26 47.4
Alpheratz	358 11.1	N28 58.3
Altair	62 34.6	N 8 48.8
Ankaa	353 42.0	S42 25.7
Antares	112 59.5	S26 22.9
Arcturus	146 20.5	N19 17.8
Atria	108 26.0	S68 59.2
Avior	234 28.4	S59 26.2
Bellatrix	279 00.4	N 6 19.7
Betelgeuse	271 30.0	N 7 24.1
Canopus	264 07.5	S52 41.1
Capella	281 13.6	N45 58.5
Deneb	49 50.0	N45 12.4
Denebola	183 01.0	N14 41.6
Diphda	349 22.6	S18 06.5
Dubhe	194 24.5	N61 51.9
Elnath	278 46.1	N28 35.3
Eltanin	90 59.1	N51 29.7
Enif	34 13.6	N 9 46.6
Fomalhaut	15 53.6	S29 44.5
Gacrux	172 30.9	S56 59.1
Gienah	176 20.0	S17 25.1
Hadar	149 26.3	S60 15.7
Hamal	328 30.8	N23 21.6
Kaus Aust.	84 19.7	S34 23.7
Kochab	137 20.1	N74 14.6
Markab	14 05.0	N15 05.4
Menkar	314 42.8	N 4 00.2
Menkent	148 39.5	S36 15.5
Miaplacidus	221 44.7	S69 37.4
Mirfak	309 18.3	N49 47.1
Nunki	76 31.9	S26 19.4
Peacock	54 01.8	S56 48.5
Pollux	244 00.2	N28 04.6
Procyon	245 27.5	N 5 16.8
Rasalhague	96 31.7	N12 34.7
Regulus	208 11.9	N12 04.4
Rigel	281 37.5	S 8 13.7
Rigil Kent.	140 28.8	S60 44.3
Sabik	102 43.6	S15 41.7
Schedar	350 10.8	N56 25.3
Shaula	96 58.7	S37 05.2
Sirius	258 57.0	S16 41.2
Spica	158 59.7	S11 02.7
Suhail	223 11.9	S43 20.5
Vega	80 57.5	N38 46.0
Zuben'ubi	137 35.4	S15 56.9

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	114 14.9	11 09
Mars	225 10.6	3 44
Jupiter	266 56.8	0 58
Saturn	206 54.3	4 57

	G.M.T.	SUN G.H.A.	SUN Dec.	MOON G.H.A.	*v*	MOON Dec.	*d*	H.P.
	d h	° ′	° ′	° ′	′	° ′	′	′
	9 00	181 57.7	S22 47.1	206 56.2	5.3	S15 14.6	6.9	60.8
	01	196 57.4	47.3	221 20.5	5.2	15 21.5	6.8	60.8
	02	211 57.1	47.6	235 44.7	5.1	15 28.3	6.7	60.9
	03	226 56.8	·· 47.8	250 08.8	5.1	15 35.0	6.5	60.9
	04	241 56.6	48.1	264 32.9	5.0	15 41.5	6.5	60.9
	05	256 56.3	48.3	278 56.9	4.9	15 48.0	6.4	60.9
	06	271 56.0	S22 48.6	293 20.8	4.9	S15 54.4	6.3	61.0
	07	286 55.7	48.8	307 44.7	4.8	16 00.7	6.1	61.0
	08	301 55.4	49.0	322 08.5	4.7	16 06.8	6.0	61.0
F	09	316 55.2	·· 49.3	336 32.2	4.6	16 12.8	6.0	61.0
R	10	331 54.9	49.5	350 55.8	4.6	16 18.8	5.8	61.1
I	11	346 54.6	49.8	5 19.4	4.5	16 24.6	5.7	61.1
D	12	1 54.3	S22 50.0	19 42.9	4.5	S16 30.3	5.6	61.1
A	13	16 54.0	50.3	34 06.4	4.3	16 35.9	5.4	61.1
Y	14	31 53.8	50.5	48 29.7	4.4	16 41.3	5.4	61.1
	15	46 53.5	·· 50.7	62 53.1	4.2	16 46.7	5.2	61.2
	16	61 53.2	51.0	77 16.3	4.2	16 51.9	5.1	61.2
	17	76 52.9	51.2	91 39.5	4.1	16 57.0	5.0	61.2
	18	91 52.6	S22 51.4	106 02.6	4.1	S17 02.0	4.9	61.2
	19	106 52.4	51.7	120 25.7	4.0	17 06.9	4.7	61.2
	20	121 52.1	51.9	134 48.7	4.0	17 11.6	4.6	61.2
	21	136 51.8	·· 52.2	149 11.7	3.9	17 16.2	4.5	61.3
	22	151 51.5	52.4	163 34.6	3.9	17 20.7	4.4	61.3
	23	166 51.2	52.6	177 57.5	3.8	17 25.1	4.2	61.3
	10 00	181 50.9	S22 52.9	192 20.3	3.7	S17 29.3	4.1	61.3
	01	196 50.7	53.1	206 43.0	3.7	17 33.4	4.0	61.3
	02	211 50.4	53.3	221 05.7	3.7	17 37.4	3.9	61.3
	03	226 50.1	·· 53.5	235 28.4	3.6	17 41.3	3.7	61.3
	04	241 49.8	53.8	249 51.0	3.6	17 45.0	3.5	61.4
	05	256 49.5	54.0	264 13.6	3.5	17 48.5	3.5	61.4
	06	271 49.2	S22 54.2	278 36.1	3.5	S17 52.0	3.3	61.4
	07	286 49.0	54.5	292 58.6	3.5	17 55.3	3.2	61.4
S	08	301 48.7	54.7	307 21.1	3.4	17 58.5	3.0	61.4
A	09	316 48.4	·· 54.9	321 43.5	3.4	18 01.5	2.9	61.4
T	10	331 48.1	55.1	336 05.9	3.4	18 04.4	2.8	61.4
U	11	346 47.8	55.3	350 28.3	3.3	18 07.2	2.6	61.4
R	12	1 47.5	S22 55.6	4 50.6	3.3	S18 09.8	2.5	61.4
D	13	16 47.3	55.8	19 12.9	3.3	18 12.3	2.4	61.4
A	14	31 47.0	56.0	33 35.2	3.2	18 14.7	2.2	61.4
Y	15	46 46.7	·· 56.2	47 57.4	3.2	18 16.9	2.1	61.5
	16	61 46.4	56.5	62 19.6	3.2	18 19.0	1.9	61.5
	17	76 46.1	56.7	76 41.8	3.2	18 20.9	1.8	61.5
	18	91 45.8	S22 56.9	91 04.0	3.2	S18 22.7	1.7	61.5
	19	106 45.5	57.1	105 26.2	3.1	18 24.4	1.5	61.5
	20	121 45.3	57.3	119 48.3	3.1	18 25.9	1.4	61.5
	21	136 45.0	·· 57.5	134 10.4	3.2	18 27.3	1.2	61.5
	22	151 44.7	57.8	148 32.6	3.1	18 28.5	1.1	61.5
	23	166 44.4	58.0	162 54.7	3.1	18 29.6	1.0	61.5
	11 00	181 44.1	S22 58.2	177 16.8	3.1	S18 30.6	0.8	61.5
	01	196 43.8	58.4	191 38.9	3.1	18 31.4	0.6	61.5
	02	211 43.5	58.6	206 01.0	3.1	18 32.0	0.6	61.5
	03	226 43.2	·· 58.8	220 23.1	3.1	18 32.6	0.4	61.5
	04	241 43.0	59.0	234 45.2	3.1	18 33.0	0.2	61.5
	05	256 42.7	59.2	249 07.3	3.1	18 33.2	0.1	61.5
	06	271 42.4	S22 59.4	263 29.4	3.1	S18 33.3	0.1	61.5
	07	286 42.1	59.6	277 51.5	3.1	18 33.2	0.1	61.5
	08	301 41.8	22 59.9	292 13.6	3.1	18 33.1	0.4	61.4
S	09	316 41.5	23 00.1	306 35.7	3.1	18 32.7	0.5	61.4
U	10	331 41.2	00.3	320 57.8	3.2	18 32.2	0.6	61.4
N	11	346 40.9	00.5	335 20.0	3.1	18 31.6	0.7	61.4
D	12	1 40.6	S23 00.7	349 42.1	3.2	S18 30.9	0.9	61.4
A	13	16 40.4	00.9	4 04.3	3.2	18 30.0	1.1	61.4
Y	14	31 40.1	01.1	18 26.5	3.2	18 28.9	1.1	61.4
	15	46 39.8	·· 01.3	32 48.7	3.3	18 27.8	1.4	61.4
	16	61 39.5	01.5	47 11.0	3.3	18 26.4	1.4	61.4
	17	76 39.2	01.7	61 33.3	3.3	18 25.0	1.6	61.4
	18	91 38.9	S23 01.9	75 55.6	3.3	S18 23.4	1.8	61.4
	19	106 38.6	02.1	90 17.9	3.3	18 21.6	1.8	61.4
	20	121 38.3	02.3	104 40.2	3.4	18 19.8	2.1	61.3
	21	136 38.0	·· 02.5	119 02.6	3.5	18 17.7	2.1	61.3
	22	151 37.7	02.7	133 25.1	3.4	18 15.6	2.3	61.3
	23	166 37.5	02.9	147 47.5	3.5	18 13.3	2.4	61.3
		S.D. 16.3	*d* 0.2	S.D. 16.6		16.7		16.7

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 9	Moonrise 10	Moonrise 11	Moonrise 12
°	h m	h m	h m	h m	h m	h m	h m
N 72	08 12	10 29	■	08 53	■	■	12 55
N 70	07 53	09 37	■	08 05	09 55	11 13	11 46
68	07 38	09 05	■	07 35	09 12	10 25	11 09
66	07 26	08 41	10 15	07 13	08 43	09 54	10 42
64	07 15	08 22	09 37	06 55	08 21	09 31	10 22
62	07 06	08 07	09 11	06 40	08 03	09 13	10 05
60	06 58	07 54	08 51	06 28	07 49	08 57	09 51
N 58	06 51	07 43	08 34	06 18	07 36	08 45	09 40
56	06 44	07 33	08 20	06 08	07 25	08 33	09 29
54	06 38	07 24	08 08	06 00	07 16	08 24	09 20
52	06 33	07 16	07 57	05 53	07 08	08 15	09 12
50	06 28	07 09	07 47	05 47	07 00	08 07	09 05
45	06 16	06 53	07 27	05 33	06 44	07 50	08 49
N 40	06 06	06 40	07 11	05 21	06 31	07 37	08 36
35	05 57	06 29	06 57	05 11	06 20	07 25	08 25
30	05 49	06 19	06 45	05 03	06 10	07 15	08 15
20	05 33	06 00	06 24	04 48	05 53	06 57	07 59
N 10	05 17	05 43	06 06	04 35	05 38	06 42	07 44
0	05 01	05 27	05 49	04 23	05 25	06 28	07 31
S 10	04 42	05 09	05 32	04 12	05 11	06 14	07 17
20	04 20	04 49	05 13	03 59	04 57	05 59	07 03
30	03 51	04 25	04 52	03 45	04 40	05 41	06 46
35	03 33	04 10	04 39	03 37	04 31	05 31	06 37
40	03 11	03 52	04 25	03 27	04 20	05 20	06 26
45	02 41	03 30	04 07	03 16	04 07	05 06	06 13
S 50	01 58	03 01	03 45	03 03	03 52	04 50	05 57
52	01 32	02 47	03 35	02 57	03 45	04 42	05 49
54	00 54	02 30	03 23	02 50	03 37	04 34	05 41
56	////	02 09	03 09	02 43	03 28	04 24	05 32
58	////	01 41	02 53	02 34	03 18	04 13	05 22
S 60	////	00 59	02 34	02 25	03 06	04 01	05 10

Lat.	Sunset	Twilight Civil	Twilight Naut.	Moonset 9	Moonset 10	Moonset 11	Moonset 12
°	h m	h m	h m	h m	h m	h m	h m
N 72	■	13 16	15 33	12 12	■	■	14 44
N 70	■	14 08	15 52	13 00	13 20	14 15	15 52
68	■	14 40	16 07	13 31	14 04	15 02	16 29
66	13 30	15 04	16 20	13 54	14 33	15 33	16 55
64	14 08	15 23	16 30	14 12	14 55	15 56	17 15
62	14 34	15 38	16 39	14 28	15 13	16 15	17 31
60	14 55	15 51	16 47	14 40	15 28	16 30	17 45
N 58	15 11	16 03	16 55	14 51	15 40	16 43	17 56
56	15 26	16 12	17 01	15 01	15 51	16 54	18 06
54	15 38	16 21	17 07	15 09	16 01	17 03	18 15
52	15 49	16 29	17 13	15 17	16 09	17 12	18 23
50	15 58	16 36	17 18	15 24	16 17	17 20	18 30
45	16 18	16 52	17 29	15 39	16 34	17 36	18 45
N 40	16 35	17 05	17 39	15 51	16 47	17 50	18 58
35	16 49	17 17	17 48	16 01	16 58	18 02	19 08
30	17 01	17 27	17 57	16 10	17 09	18 12	19 17
20	17 21	17 45	18 13	16 26	17 26	18 29	19 33
N 10	17 39	18 02	18 29	16 39	17 41	18 44	19 47
0	17 57	18 19	18 45	16 52	17 55	18 58	20 00
S 10	18 14	18 37	19 04	17 05	18 09	19 12	20 13
20	18 32	18 57	19 26	17 19	18 24	19 27	20 26
30	18 54	19 21	19 54	17 35	18 41	19 44	20 42
35	19 07	19 36	20 13	17 44	18 51	19 54	20 51
40	19 21	19 54	20 35	17 54	19 02	20 05	21 01
45	19 39	20 16	21 05	18 06	19 16	20 18	21 13
S 50	20 01	20 45	21 49	18 21	19 32	20 34	21 27
52	20 11	20 59	22 15	18 28	19 40	20 42	21 34
54	20 23	21 17	22 54	18 36	19 48	20 50	21 41
56	20 37	21 38	////	18 45	19 58	21 00	21 50
58	20 53	22 06	////	18 55	20 08	21 10	21 59
S 60	21 13	22 49	////	19 06	20 21	21 23	22 10

Day	SUN			MOON			
	Eqn. of Time 00ʰ	Eqn. of Time 12ʰ	Mer. Pass.	Mer. Pass. Upper	Mer. Pass. Lower	Age	Phase
	m s	m s	h m	h m	h m	d	
9	07 51	07 38	11 52	10 38	23 09	28	●
10	07 24	07 11	11 53	11 40	24 11	29	
11	06 57	06 43	11 53	12 43	00 11	01	

1977 DECEMBER 12, 13, 14 (MON., TUES., WED.)

G.M.T.	ARIES	VENUS −3.4		MARS −0.4		JUPITER −2.3		SATURN +0.7		STARS		
	G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	Name	S.H.A.	Dec.
d h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	° ′
12 00	80 34.7	192 10.5	S21 26.8	305 40.8	N20 11.8	347 48.4	N23 08.0	287 28.8	N12 32.2	Acamar	315 38.3	S40 23.8
01	95 37.2	207 09.6	27.4	320 43.2	11.9	2 51.2	08.0	302 31.2	32.3	Achernar	335 46.4	S57 21.2
02	110 39.7	222 08.8	27.9	335 45.6	12.0	17 54.0	08.0	317 33.7	32.3	Acrux	173 39.3	S62 58.3
03	125 42.1	237 07.9	· · 28.5	350 48.0	· · 12.1	32 56.8	· · 08.0	332 36.2	· · 32.3	Adhara	255 33.2	S28 56.6
04	140 44.6	252 07.0	29.0	5 50.5	12.2	47 59.6	08.0	347 38.6	32.3	Aldebaran	291 19.8	N16 27.9
05	155 47.1	267 06.2	29.6	20 52.9	12.3	63 02.5	08.0	2 41.1	32.3			
06	170 49.5	282 05.3	S21 30.1	35 55.3	N20 12.4	78 05.3	N23 08.1	17 43.6	N12 32.3	Alioth	166 44.5	N56 04.5
07	185 52.0	297 04.4	30.7	50 57.7	12.5	93 08.1	08.1	32 46.0	32.3	Alkaid	153 20.3	N49 25.2
08	200 54.4	312 03.6	31.2	66 00.1	12.6	108 10.9	08.1	47 48.5	32.3	Al Na'ir	28 17.5	S47 04.2
M 09	215 56.9	327 02.7	· · 31.8	81 02.5	· · 12.7	123 13.7	· · 08.1	62 51.0	· · 32.3	Alnilam	276 13.2	S 1 13.0
O 10	230 59.4	342 01.8	32.3	96 04.9	12.8	138 16.5	08.1	77 53.4	32.3	Alphard	218 22.2	S 8 33.8
N 11	246 01.8	357 01.0	32.9	111 07.4	12.9	153 19.4	08.1	92 55.9	32.4			
D 12	261 04.3	12 00.1	S21 33.4	126 09.8	N20 13.0	168 22.2	N23 08.1	107 58.3	N12 32.4	Alphecca	126 34.1	N26 47.4
A 13	276 06.8	26 59.2	34.0	141 12.2	13.1	183 25.0	08.1	123 00.8	32.4	Alpheratz	358 11.1	N28 58.3
Y 14	291 09.2	41 58.4	34.5	156 14.6	13.2	198 27.8	08.2	138 03.3	32.4	Altair	62 34.6	N 8 48.8
15	306 11.7	56 57.5	· · 35.0	171 17.0	· · 13.3	213 30.6	· · 08.2	153 05.7	· · 32.4	Ankaa	353 42.0	S42 25.7
16	321 14.2	71 56.6	35.6	186 19.5	13.4	228 33.5	08.2	168 08.2	32.4	Antares	112 59.5	S26 22.9
17	336 16.6	86 55.7	36.1	201 21.9	13.5	243 36.3	08.2	183 10.7	32.4			
18	351 19.1	101 54.9	S21 36.7	216 24.3	N20 13.7	258 39.1	N23 08.2	198 13.1	N12 32.4	Arcturus	146 20.4	N19 17.8
19	6 21.6	116 54.0	37.2	231 26.7	13.8	273 41.9	08.2	213 15.6	32.4	Atria	108 25.9	S68 59.1
20	21 24.0	131 53.1	37.7	246 29.2	13.9	288 44.7	08.2	228 18.1	32.4	Avior	234 28.4	S59 26.2
21	36 26.5	146 52.3	· · 38.3	261 31.6	· · 14.0	303 47.6	· · 08.2	243 20.5	· · 32.5	Bellatrix	279 00.4	N 6 19.7
22	51 28.9	161 51.4	38.8	276 34.0	14.1	318 50.4	08.2	258 23.0	32.5	Betelgeuse	271 30.0	N 7 24.1
23	66 31.4	176 50.5	39.3	291 36.5	14.2	333 53.2	08.3	273 25.5	32.5			
13 00	81 33.9	191 49.6	S21 39.9	306 38.9	N20 14.3	348 56.0	N23 08.3	288 27.9	N12 32.5	Canopus	264 07.5	S52 41.1
01	96 36.3	206 48.8	40.4	321 41.4	14.4	3 58.8	08.3	303 30.4	32.5	Capella	281 13.5	N45 58.5
02	111 38.8	221 47.9	40.9	336 43.8	14.5	19 01.7	08.3	318 32.9	32.5	Deneb	49 50.0	N45 12.4
03	126 41.3	236 47.0	· · 41.4	351 46.2	· · 14.6	34 04.5	· · 08.3	333 35.3	· · 32.5	Denebola	183 01.0	N14 41.6
04	141 43.7	251 46.1	42.0	6 48.7	14.7	49 07.3	08.3	348 37.8	32.5	Diphda	349 22.7	S18 06.5
05	156 46.2	266 45.3	42.5	21 51.1	14.8	64 10.1	08.3	3 40.3	32.6			
06	171 48.7	281 44.4	S21 43.0	36 53.6	N20 15.0	79 12.9	N23 08.3	18 42.7	N12 32.6	Dubhe	194 24.5	N61 51.9
07	186 51.1	296 43.5	43.5	51 56.0	15.1	94 15.8	08.3	33 45.2	32.6	Elnath	278 46.1	N28 35.3
08	201 53.6	311 42.6	44.1	66 58.5	15.2	109 18.6	08.4	48 47.7	32.6	Eltanin	90 59.1	N51 29.7
T 09	216 56.1	326 41.8	· · 44.6	82 00.9	· · 15.3	124 21.4	· · 08.4	63 50.2	· · 32.6	Enif	34 13.6	N 9 46.6
U 10	231 58.5	341 40.9	45.1	97 03.4	15.4	139 24.2	08.4	78 52.6	32.6	Fomalhaut	15 53.6	S29 44.5
E 11	247 01.0	356 40.0	45.6	112 05.8	15.5	154 27.0	08.4	93 55.1	32.6			
S 12	262 03.4	11 39.1	S21 46.1	127 08.3	N20 15.6	169 29.9	N23 08.4	108 57.6	N12 32.6	Gacrux	172 30.9	S56 59.1
D 13	277 05.9	26 38.3	46.7	142 10.7	15.7	184 32.7	08.4	124 00.0	32.6	Gienah	176 19.9	S17 25.1
A 14	292 08.4	41 37.4	47.2	157 13.2	15.9	199 35.5	08.4	139 02.5	32.7	Hadar	149 26.3	S60 15.7
Y 15	307 10.8	56 36.5	· · 47.7	172 15.6	· · 16.0	214 38.3	· · 08.4	154 05.0	· · 32.7	Hamal	328 30.8	N23 21.6
16	322 13.3	71 35.6	48.2	187 18.1	16.1	229 41.1	08.4	169 07.4	32.7	Kaus Aust.	84 19.7	S34 23.7
17	337 15.8	86 34.7	48.7	202 20.6	16.2	244 44.0	08.5	184 09.9	32.7			
18	352 18.2	101 33.9	S21 49.2	217 23.0	N20 16.3	259 46.8	N23 08.5	199 12.4	N12 32.7	Kochab	137 20.1	N74 14.6
19	7 20.7	116 33.0	49.7	232 25.5	16.4	274 49.6	08.5	214 14.9	32.7	Markab	14 05.0	N15 05.4
20	22 23.2	131 32.1	50.2	247 27.9	16.5	289 52.4	08.5	229 17.3	32.7	Menkar	314 42.8	N 4 00.2
21	37 25.6	146 31.2	· · 50.7	262 30.4	· · 16.7	304 55.3	· · 08.5	244 19.8	· · 32.7	Menkent	148 39.4	S36 15.5
22	52 28.1	161 30.3	51.3	277 32.9	16.8	319 58.1	08.5	259 22.3	32.8	Miaplacidus	221 44.6	S69 37.4
23	67 30.5	176 29.5	51.8	292 35.3	16.9	335 00.9	08.5	274 24.7	32.8			
14 00	82 33.0	191 28.6	S21 52.3	307 37.8	N20 17.0	350 03.7	N23 08.5	289 27.2	N12 32.8	Mirfak	309 18.3	N49 47.1
01	97 35.5	206 27.7	52.8	322 40.3	17.1	5 06.5	08.5	304 29.7	32.8	Nunki	76 31.8	S26 19.4
02	112 37.9	221 26.8	53.3	337 42.8	17.3	20 09.4	08.6	319 32.2	32.8	Peacock	54 01.8	S56 48.5
03	127 40.4	236 25.9	· · 53.8	352 45.2	· · 17.4	35 12.2	· · 08.6	334 34.6	· · 32.8	Pollux	244 00.1	N28 04.6
04	142 42.9	251 25.0	54.3	7 47.7	17.5	50 15.0	08.6	349 37.1	32.8	Procyon	245 27.4	N 5 16.8
05	157 45.3	266 24.1	54.8	22 50.2	17.6	65 17.8	08.6	4 39.6	32.9			
06	172 47.8	281 23.3	S21 55.3	37 52.7	N20 17.7	80 20.7	N23 08.6	19 42.0	N12 32.9	Rasalhague	96 31.7	N12 34.7
W 07	187 50.3	296 22.4	55.8	52 55.2	17.9	95 23.5	08.6	34 44.5	32.9	Regulus	208 11.9	N12 04.4
E 08	202 52.7	311 21.5	56.3	67 57.6	18.0	110 26.3	08.6	49 47.0	32.9	Rigel	281 37.5	S 8 13.7
D 09	217 55.2	326 20.6	· · 56.8	83 00.1	· · 18.1	125 29.1	· · 08.6	64 49.5	· · 32.9	Rigil Kent.	140 28.8	S60 44.3
N 10	232 57.7	341 19.7	57.2	98 02.6	18.2	140 32.0	08.6	79 51.9	32.9	Sabik	102 43.6	S15 41.7
E 11	248 00.1	356 18.8	57.7	113 05.1	18.3	155 34.8	08.7	94 54.4	32.9			
S 12	263 02.6	11 17.9	S21 58.2	128 07.6	N20 18.5	170 37.6	N23 08.7	109 56.9	N12 32.9	Schedar	350 10.8	N56 25.3
D 13	278 05.0	26 17.1	58.7	143 10.1	18.6	185 40.4	08.7	124 59.4	33.0	Shaula	96 58.7	S37 05.2
A 14	293 07.5	41 16.2	59.2	158 12.6	18.7	200 43.3	08.7	140 01.8	33.0	Sirius	258 57.0	S16 41.2
Y 15	308 10.0	56 15.3	21 59.7	173 15.0	· · 18.8	215 46.1	· · 08.7	155 04.3	· · 33.0	Spica	158 59.7	S11 02.7
16	323 12.4	71 14.4	22 00.2	188 17.5	19.0	230 48.9	08.7	170 06.8	33.0	Suhail	223 11.8	S43 20.5
17	338 14.9	86 13.5	00.7	203 20.0	19.1	245 51.7	08.7	185 09.3	33.0			
18	353 17.4	101 12.6	S22 01.1	218 22.5	N20 19.2	260 54.5	N23 08.7	200 11.7	N12 33.0	Vega	80 57.5	N38 46.0
19	8 19.8	116 11.7	01.6	233 25.0	19.3	275 57.4	08.7	215 14.2	33.0	Zuben'ubi	137 35.4	S15 56.9
20	23 22.3	131 10.8	02.1	248 27.5	19.5	291 00.2	08.8	230 16.7	33.1			
21	38 24.8	146 09.9	· · 02.6	263 30.0	· · 19.6	306 03.0	· · 08.8	245 19.2	· · 33.1			
22	53 27.2	161 09.0	03.1	278 32.5	19.7	321 05.8	08.8	260 21.6	33.1			
23	68 29.7	176 08.2	03.5	293 35.0	19.8	336 08.7	08.8	275 24.1	33.1			
Mer. Pass.	h m 18 30.7	*v* −0.9	*d* 0.5	*v* 2.5	*d* 0.1	*v* 2.8	*d* 0.0	*v* 2.5	*d* 0.0			

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	110 15.8	11 13
Mars	225 05.0	3 33
Jupiter	267 22.1	0 44
Saturn	206 54.1	4 45

1977 DECEMBER 12, 13, 14 (MON., TUES., WED.)

	G.M.T.	SUN G.H.A.	SUN Dec.	MOON G.H.A.	MOON *v*	MOON Dec.	MOON *d*	MOON H.P.
	d h	° ′	° ′	° ′	′	° ′	′	′
	12 00	181 37.2	S23 03.1	162 10.0	3.6	S18 10.9	2.6	61.3
	01	196 36.9	03.2	176 32.6	3.5	18 08.3	2.7	61.3
	02	211 36.6	03.4	190 55.1	3.7	18 05.6	2.8	61.3
	03	226 36.3	·· 03.6	205 17.8	3.6	18 02.8	3.0	61.2
	04	241 36.0	03.8	219 40.4	3.7	17 59.8	3.1	61.2
	05	256 35.7	04.0	234 03.1	3.8	17 56.7	3.2	61.2
	06	271 35.4	S23 04.2	248 25.9	3.8	S17 53.5	3.4	61.2
	07	286 35.1	04.4	262 48.7	3.9	17 50.1	3.5	61.2
	08	301 34.8	04.6	277 11.6	3.9	17 46.6	3.6	61.2
M	09	316 34.5	·· 04.8	291 34.5	4.0	17 43.0	3.8	61.1
O	10	331 34.2	05.0	305 57.5	4.0	17 39.2	3.9	61.1
N	11	346 34.0	05.1	320 20.5	4.1	17 35.3	4.0	61.1
D	12	1 33.7	S23 05.3	334 43.6	4.1	S17 31.3	4.1	61.1
A	13	16 33.4	05.5	349 06.7	4.2	17 27.2	4.3	61.1
Y	14	31 33.1	05.7	3 29.9	4.3	17 22.9	4.4	61.0
	15	46 32.8	·· 05.9	17 53.2	4.3	17 18.5	4.5	61.0
	16	61 32.5	06.1	32 16.5	4.4	17 14.0	4.6	61.0
	17	76 32.2	06.2	46 39.9	4.5	17 09.4	4.7	61.0
	18	91 31.9	S23 06.4	61 03.4	4.5	S17 04.7	4.9	60.9
	19	106 31.6	06.6	75 26.9	4.6	16 59.8	5.0	60.9
	20	121 31.3	06.8	89 50.5	4.6	16 54.8	5.1	60.9
	21	136 31.0	·· 06.9	104 14.1	4.7	16 49.7	5.2	60.9
	22	151 30.7	07.1	118 37.8	4.8	16 44.5	5.3	60.8
	23	166 30.4	07.3	133 01.6	4.9	16 39.2	5.5	60.8
	13 00	181 30.1	S23 07.5	147 25.5	4.9	S16 33.7	5.6	60.8
	01	196 29.8	07.6	161 49.4	5.1	16 28.1	5.6	60.8
	02	211 29.5	07.8	176 13.5	5.1	16 22.5	5.8	60.7
	03	226 29.3	·· 08.0	190 37.6	5.1	16 16.7	5.9	60.7
	04	241 29.0	08.2	205 01.7	5.3	16 10.8	6.0	60.7
	05	256 28.7	08.3	219 26.0	5.3	16 04.8	6.1	60.7
	06	271 28.4	S23 08.5	233 50.3	5.4	S15 58.7	6.2	60.6
	07	286 28.1	08.7	248 14.7	5.4	15 52.5	6.3	60.6
T	08	301 27.8	08.8	262 39.1	5.6	15 46.2	6.5	60.6
U	09	316 27.5	·· 09.0	277 03.7	5.6	15 39.7	6.5	60.5
E	10	331 27.2	09.2	291 28.3	5.7	15 33.2	6.6	60.5
S	11	346 26.9	09.3	305 53.0	5.8	15 26.6	6.7	60.5
D	12	1 26.6	S23 09.5	320 17.8	5.9	S15 19.9	6.8	60.4
A	13	16 26.3	09.7	334 42.7	6.0	15 13.1	6.9	60.4
Y	14	31 26.0	09.8	349 07.7	6.0	15 06.2	7.0	60.4
	15	46 25.7	·· 10.0	3 32.7	6.1	14 59.2	7.1	60.4
	16	61 25.4	10.2	17 57.8	6.3	14 52.1	7.2	60.3
	17	76 25.1	10.3	32 23.1	6.3	14 44.9	7.3	60.3
	18	91 24.8	S23 10.5	46 48.4	6.3	S14 37.6	7.4	60.3
	19	106 24.5	10.6	61 13.7	6.5	14 30.2	7.4	60.2
	20	121 24.2	10.8	75 39.2	6.5	14 22.8	7.6	60.2
	21	136 23.9	·· 11.0	90 04.7	6.7	14 15.2	7.6	60.2
	22	151 23.6	11.1	104 30.4	6.7	14 07.6	7.7	60.1
	23	166 23.3	11.3	118 56.1	6.8	13 59.9	7.8	60.1
	14 00	181 23.0	S23 11.4	133 21.9	6.9	S13 52.1	7.9	60.1
	01	196 22.7	11.6	147 47.8	7.0	13 44.2	8.0	60.0
	02	211 22.4	11.7	162 13.8	7.0	13 36.2	8.0	60.0
	03	226 22.1	·· 11.9	176 39.8	7.2	13 28.2	8.1	59.9
	04	241 21.8	12.0	191 06.0	7.2	13 20.1	8.2	59.9
	05	256 21.5	12.2	205 32.2	7.4	13 11.9	8.2	59.9
	06	271 21.2	S23 12.4	219 58.6	7.4	S13 03.7	8.4	59.8
W	07	286 20.9	12.5	234 25.0	7.5	12 55.3	8.4	59.8
E	08	301 20.6	12.7	248 51.5	7.5	12 46.9	8.5	59.8
D	09	316 20.3	·· 12.8	263 18.0	7.7	12 38.4	8.5	59.7
N	10	331 20.0	12.9	277 44.7	7.8	12 29.9	8.6	59.7
E	11	346 19.7	13.1	292 11.5	7.8	12 21.3	8.7	59.7
S	12	1 19.4	S23 13.2	306 38.3	7.9	S12 12.6	8.7	59.6
D	13	16 19.1	13.4	321 05.2	8.1	12 03.9	8.8	59.6
A	14	31 18.8	13.5	335 32.3	8.1	11 55.1	8.9	59.5
Y	15	46 18.5	·· 13.7	349 59.4	8.1	11 46.2	8.9	59.5
	16	61 18.2	13.8	4 26.5	8.3	11 37.3	9.0	59.5
	17	76 17.9	14.0	18 53.8	8.4	11 28.3	9.0	59.4
	18	91 17.6	S23 14.1	33 21.2	8.4	S11 19.3	9.1	59.4
	19	106 17.3	14.2	47 48.6	8.5	11 10.2	9.2	59.4
	20	121 17.0	14.4	62 16.1	8.6	11 01.0	9.2	59.3
	21	136 16.7	·· 14.5	76 43.7	8.7	10 51.8	9.2	59.3
	22	151 16.4	14.7	91 11.4	8.8	10 42.6	9.3	59.2
	23	166 16.1	14.8	105 39.2	8.8	10 33.3	9.4	59.2
		S.D. 16.3	*d* 0.2	S.D. 16.6		16.5		16.2

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 12	Moonrise 13	Moonrise 14	Moonrise 15
°	h m	h m	h m	h m	h m	h m	h m
N 72	08 17	10 40	▬	12 55	12 33	12 23	12 16
N 70	07 58	09 44	▬	11 46	11 57	12 02	12 03
68	07 42	09 10	▬	11 09	11 32	11 45	11 53
66	07 30	08 46	10 23	10 42	11 12	11 31	11 44
64	07 19	08 27	09 43	10 22	10 56	11 20	11 37
62	07 09	08 11	09 16	10 05	10 43	11 10	11 31
60	07 01	07 58	08 55	09 51	10 32	11 02	11 25
N 58	06 54	07 46	08 38	09 40	10 22	10 55	11 20
56	06 47	07 36	08 23	09 29	10 13	10 48	11 16
54	06 41	07 27	08 11	09 20	10 06	10 42	11 12
52	06 36	07 19	08 00	09 12	09 59	10 37	11 09
50	06 30	07 12	07 50	09 05	09 53	10 32	11 05
45	06 19	06 56	07 30	08 49	09 39	10 22	10 58
N 40	06 09	06 43	07 13	08 36	09 28	10 13	10 53
35	05 59	06 31	06 59	08 25	09 19	10 06	10 48
30	05 51	06 21	06 47	08 15	09 10	09 59	10 43
20	05 35	06 02	06 26	07 59	08 56	09 48	10 35
N 10	05 19	05 45	06 08	07 44	08 43	09 38	10 28
0	05 02	05 28	05 50	07 31	08 31	09 28	10 22
S 10	04 43	05 10	05 33	07 17	08 19	09 19	10 16
20	04 21	04 50	05 14	07 03	08 07	09 09	10 09
30	03 52	04 25	04 53	06 46	07 52	08 58	10 01
35	03 34	04 10	04 40	06 37	07 44	08 51	09 56
40	03 11	03 52	04 25	06 26	07 34	08 44	09 51
45	02 41	03 30	04 07	06 13	07 23	08 35	09 45
S 50	01 56	03 01	03 45	05 57	07 09	08 24	09 38
52	01 30	02 46	03 34	05 49	07 03	08 19	09 35
54	00 48	02 28	03 22	05 41	06 56	08 14	09 31
56	////	02 07	03 08	05 32	06 48	08 08	09 27
58	////	01 38	02 52	05 22	06 39	08 01	09 22
S 60	////	00 53	02 32	05 10	06 29	07 53	09 17

Lat.	Sunset	Twilight Civil	Twilight Naut.	Moonset 12	Moonset 13	Moonset 14	Moonset 15
°	h m	h m	h m	h m	h m	h m	h m
N 72	▬	13 08	15 31	14 44	17 11	19 18	21 14
N 70	▬	14 04	15 50	15 52	17 46	19 38	21 25
68	▬	14 38	16 06	16 29	18 10	19 53	21 33
66	13 25	15 02	16 19	16 55	18 29	20 06	21 41
64	14 05	15 22	16 30	17 15	18 44	20 16	21 47
62	14 32	15 37	16 39	17 31	18 57	20 25	21 52
60	14 53	15 51	16 47	17 45	19 08	20 33	21 56
N 58	15 11	16 02	16 54	17 56	19 17	20 39	22 00
56	15 25	16 12	17 01	18 06	19 25	20 45	22 04
54	15 37	16 21	17 07	18 15	19 32	20 50	22 07
52	15 48	16 29	17 13	18 23	19 39	20 55	22 10
50	15 58	16 36	17 18	18 30	19 44	20 59	22 12
45	16 19	16 52	17 29	18 45	19 57	21 08	22 18
N 40	16 35	17 06	17 40	18 58	20 07	21 16	22 23
35	16 49	17 17	17 49	19 08	20 16	21 22	22 27
30	17 01	17 28	17 58	19 17	20 24	21 28	22 30
20	17 22	17 46	18 14	19 33	20 37	21 38	22 36
N 10	17 41	18 04	18 30	19 47	20 48	21 46	22 41
0	17 58	18 20	18 47	20 00	20 59	21 54	22 46
S 10	18 15	18 38	19 05	20 13	21 10	22 02	22 51
20	18 34	18 59	19 28	20 26	21 21	22 11	22 56
30	18 56	19 23	19 57	20 42	21 34	22 20	23 02
35	19 09	19 38	20 15	20 51	21 41	22 26	23 05
40	19 24	19 56	20 38	21 01	21 50	22 32	23 09
45	19 41	20 19	21 08	21 13	21 59	22 39	23 14
S 50	20 04	20 48	21 53	21 27	22 11	22 47	23 19
52	20 14	21 03	22 20	21 34	22 16	22 51	23 21
54	20 27	21 21	23 02	21 41	22 22	22 56	23 24
56	20 41	21 42	////	21 50	22 29	23 00	23 26
58	20 57	22 11	////	21 59	22 36	23 06	23 30
S 60	21 17	22 58	////	22 10	22 45	23 12	23 33

Day	SUN Eqn. of Time 00ʰ	SUN Eqn. of Time 12ʰ	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
	m s	m s	h m	h m	h m	d	
12	06 29	06 15	11 54	13 45	01 14	02	
13	06 01	05 47	11 54	14 45	02 16	03	☽
14	05 33	05 18	11 55	15 42	03 14	04	

1977 DECEMBER 15, 16, 17 (THURS., FRI., SAT.)

G.M.T.	ARIES G.H.A.	VENUS −3.4 G.H.A.	VENUS Dec.	MARS −0.5 G.H.A.	MARS Dec.	JUPITER −2.3 G.H.A.	JUPITER Dec.	SATURN +0.7 G.H.A.	SATURN Dec.
d h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
15 00	83 32.2	191 07.3	S22 04.0	308 37.5	N20 20.0	351 11.5	N23 08.8	290 26.6	N12 33.1
01	98 34.6	206 06.4	04.5	323 40.0	20.1	6 14.3	08.8	305 29.1	33.1
02	113 37.1	221 05.5	05.0	338 42.6	20.2	21 17.1	08.8	320 31.5	33.1
03	128 39.5	236 04.6	·· 05.4	353 45.1	·· 20.4	36 20.0	·· 08.8	335 34.0	·· 33.2
04	143 42.0	251 03.7	05.9	8 47.6	20.5	51 22.8	08.8	350 36.5	33.2
05	158 44.5	266 02.8	06.4	23 50.1	20.6	66 25.6	08.9	5 39.0	33.2
06	173 46.9	281 01.9	S22 06.9	38 52.6	N20 20.7	81 28.4	N23 08.9	20 41.4	N12 33.2
07	188 49.4	296 01.0	07.3	53 55.1	20.9	96 31.3	08.9	35 43.9	33.2
T 08	203 51.9	311 00.1	07.8	68 57.6	21.0	111 34.1	08.9	50 46.4	33.2
H 09	218 54.3	325 59.2	·· 08.3	84 00.2	·· 21.1	126 36.9	·· 08.9	65 48.9	·· 33.3
U 10	233 56.8	340 58.3	08.7	99 02.7	21.3	141 39.8	08.9	80 51.4	33.3
R 11	248 59.3	355 57.4	09.2	114 05.2	21.4	156 42.6	08.9	95 53.8	33.3
S 12	264 01.7	10 56.5	S22 09.7	129 07.7	N20 21.5	171 45.4	N23 08.9	110 56.3	N12 33.3
D 13	279 04.2	25 55.6	10.1	144 10.2	21.7	186 48.2	08.9	125 58.8	33.3
A 14	294 06.6	40 54.7	10.6	159 12.8	21.8	201 51.1	09.0	141 01.3	33.3
Y 15	309 09.1	55 53.8	·· 11.0	174 15.3	·· 21.9	216 53.9	·· 09.0	156 03.8	·· 33.3
16	324 11.6	70 52.9	11.5	189 17.8	22.1	231 56.7	09.0	171 06.2	33.4
17	339 14.0	85 52.0	12.0	204 20.3	22.2	246 59.5	09.0	186 08.7	33.4
18	354 16.5	100 51.1	S22 12.4	219 22.9	N20 22.3	262 02.4	N23 09.0	201 11.2	N12 33.4
19	9 19.0	115 50.2	12.9	234 25.4	22.5	277 05.2	09.0	216 13.7	33.4
20	24 21.4	130 49.3	13.3	249 27.9	22.6	292 08.0	09.0	231 16.2	33.4
21	39 23.9	145 48.4	·· 13.8	264 30.5	·· 22.7	307 10.8	·· 09.0	246 18.6	·· 33.4
22	54 26.4	160 47.5	14.2	279 33.0	22.9	322 13.7	09.0	261 21.1	33.5
23	69 28.8	175 46.6	14.7	294 35.6	23.0	337 16.5	09.1	276 23.6	33.5
16 00	84 31.3	190 45.7	S22 15.1	309 38.1	N20 23.2	352 19.3	N23 09.1	291 26.1	N12 33.5
01	99 33.8	205 44.8	15.6	324 40.6	23.3	7 22.1	09.1	306 28.6	33.5
02	114 36.2	220 43.9	16.0	339 43.2	23.4	22 25.0	09.1	321 31.0	33.5
03	129 38.7	235 43.0	·· 16.5	354 45.7	·· 23.6	37 27.8	·· 09.1	336 33.5	·· 33.5
04	144 41.1	250 42.1	16.9	9 48.3	23.7	52 30.6	09.1	351 36.0	33.6
05	159 43.6	265 41.2	17.4	24 50.8	23.8	67 33.5	09.1	6 38.5	33.6
06	174 46.1	280 40.3	S22 17.8	39 53.4	N20 24.0	82 36.3	N23 09.1	21 41.0	N12 33.6
07	189 48.5	295 39.4	18.2	54 55.9	24.1	97 39.1	09.1	36 43.4	33.6
08	204 51.0	310 38.5	18.7	69 58.5	24.3	112 41.9	09.1	51 45.9	33.6
F 09	219 53.5	325 37.6	·· 19.1	85 01.0	·· 24.4	127 44.8	·· 09.2	66 48.4	·· 33.6
R 10	234 55.9	340 36.7	19.6	100 03.6	24.6	142 47.6	09.2	81 50.9	33.7
I 11	249 58.4	355 35.8	20.0	115 06.1	24.7	157 50.4	09.2	96 53.4	33.7
D 12	265 00.9	10 34.9	S22 20.4	130 08.7	N20 24.8	172 53.3	N23 09.2	111 55.9	N12 33.7
A 13	280 03.3	25 34.0	20.9	145 11.2	25.0	187 56.1	09.2	126 58.3	33.7
Y 14	295 05.8	40 33.1	21.3	160 13.8	25.1	202 58.9	09.2	142 00.8	33.7
15	310 08.3	55 32.2	·· 21.7	175 16.4	·· 25.3	218 01.7	·· 09.2	157 03.3	·· 33.7
16	325 10.7	70 31.3	22.2	190 18.9	25.4	233 04.6	09.2	172 05.8	33.8
17	340 13.2	85 30.4	22.6	205 21.5	25.6	248 07.4	09.2	187 08.3	33.8
18	355 15.6	100 29.5	S22 23.0	220 24.1	N20 25.7	263 10.2	N23 09.3	202 10.8	N12 33.8
19	10 18.1	115 28.5	23.4	235 26.6	25.8	278 13.1	09.3	217 13.2	33.8
20	25 20.6	130 27.6	23.9	250 29.2	26.0	293 15.9	09.3	232 15.7	33.8
21	40 23.0	145 26.7	·· 24.3	265 31.8	·· 26.1	308 18.7	·· 09.3	247 18.2	·· 33.8
22	55 25.5	160 25.8	24.7	280 34.3	26.3	323 21.5	09.3	262 20.7	33.9
23	70 28.0	175 24.9	25.1	295 36.9	26.4	338 24.4	09.3	277 23.2	33.9
17 00	85 30.4	190 24.0	S22 25.6	310 39.5	N20 26.6	353 27.2	N23 09.3	292 25.7	N12 33.9
01	100 32.9	205 23.1	26.0	325 42.1	26.7	8 30.0	09.3	307 28.1	33.9
02	115 35.4	220 22.2	26.4	340 44.6	26.9	23 32.9	09.3	322 30.6	33.9
03	130 37.8	235 21.3	·· 26.8	355 47.2	·· 27.0	38 35.7	·· 09.3	337 33.1	·· 34.0
04	145 40.3	250 20.4	27.2	10 49.8	27.2	53 38.5	09.4	352 35.6	34.0
05	160 42.8	265 19.5	27.7	25 52.4	27.3	68 41.3	09.4	7 38.1	34.0
06	175 45.2	280 18.5	S22 28.1	40 55.0	N20 27.5	83 44.2	N23 09.4	22 40.6	N12 34.0
07	190 47.7	295 17.6	28.5	55 57.6	27.6	98 47.0	09.4	37 43.1	34.0
S 08	205 50.1	310 16.7	28.9	71 00.1	27.8	113 49.8	09.4	52 45.6	34.0
A 09	220 52.6	325 15.8	·· 29.3	86 02.7	·· 27.9	128 52.7	·· 09.4	67 48.0	·· 34.1
T 10	235 55.1	340 14.9	29.7	101 05.3	28.1	143 55.5	09.4	82 50.5	34.1
U 11	250 57.5	355 14.0	30.1	116 07.9	28.2	158 58.3	09.4	97 53.0	34.1
R 12	266 00.0	10 13.1	S22 30.5	131 10.5	N20 28.4	174 01.1	N23 09.4	112 55.5	N12 34.1
D 13	281 02.5	25 12.1	30.9	146 13.1	28.5	189 04.0	09.5	127 58.0	34.1
A 14	296 04.9	40 11.2	31.4	161 15.7	28.7	204 06.8	09.5	143 00.5	34.2
Y 15	311 07.4	55 10.3	·· 31.8	176 18.3	·· 28.8	219 09.6	·· 09.5	158 03.0	·· 34.2
16	326 09.9	70 09.4	32.2	191 20.9	29.0	234 12.5	09.5	173 05.5	34.2
17	341 12.3	85 08.5	32.6	206 23.5	29.1	249 15.3	09.5	188 07.9	34.2
18	356 14.8	100 07.6	S22 33.0	221 26.1	N20 29.3	264 18.1	N23 09.5	203 10.4	N12 34.2
19	11 17.2	115 06.7	33.4	236 28.7	29.4	279 21.0	09.5	218 12.9	34.3
20	26 19.7	130 05.7	33.8	251 31.3	29.6	294 23.8	09.5	233 15.4	34.3
21	41 22.2	145 04.8	·· 34.2	266 33.9	·· 29.8	309 26.6	·· 09.5	248 17.9	·· 34.3
22	56 24.6	160 03.9	34.6	281 36.5	29.9	324 29.4	09.5	263 20.4	34.3
23	71 27.1	175 03.0	34.9	296 39.1	30.1	339 32.3	09.6	278 22.9	34.3
Mer. Pass.	h m 18 18.9	v −0.9	d 0.4	v 2.6	d 0.1	v 2.8	d 0.0	v 2.5	d 0.0

STARS Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 38.4	S40 23.8
Achernar	335 46.4	S57 21.2
Acrux	173 39.3	S62 58.3
Adhara	255 33.2	S28 56.6
Aldebaran	291 19.8	N16 27.9
Alioth	166 44.4	N56 04.5
Alkaid	153 20.3	N49 25.2
Al Na'ir	28 17.5	S47 04.2
Alnilam	276 13.2	S 1 13.0
Alphard	218 22.2	S 8 33.8
Alphecca	126 34.0	N26 47.3
Alpheratz	358 11.2	N28 58.3
Altair	62 34.6	N 8 48.7
Ankaa	353 42.0	S42 25.8
Antares	112 59.5	S26 22.9
Arcturus	146 20.4	N19 17.8
Atria	108 25.9	S68 59.1
Avior	234 28.4	S59 26.2
Bellatrix	279 00.4	N 6 19.7
Betelgeuse	271 29.9	N 7 24.1
Canopus	264 07.5	S52 41.1
Capella	281 13.5	N45 58.5
Deneb	49 50.0	N45 12.4
Denebola	183 01.0	N14 41.6
Diphda	349 22.7	S18 06.5
Dubhe	194 24.4	N61 51.9
Elnath	278 46.1	N28 35.3
Eltanin	90 59.1	N51 29.6
Enif	34 13.6	N 9 46.6
Fomalhaut	15 53.6	S29 44.5
Gacrux	172 30.8	S56 59.1
Gienah	176 19.9	S17 25.1
Hadar	149 26.3	S60 15.7
Hamal	328 30.8	N23 21.6
Kaus Aust.	84 19.7	S34 23.7
Kochab	137 20.0	N74 14.6
Markab	14 05.1	N15 05.3
Menkar	314 42.8	N 4 00.2
Menkent	148 39.4	S36 15.5
Miaplacidus	221 44.6	S69 37.4
Mirfak	309 18.3	N49 47.1
Nunki	76 31.8	S26 19.4
Peacock	54 01.9	S56 48.5
Pollux	244 00.1	N28 04.6
Procyon	245 27.4	N 5 16.8
Rasalhague	96 31.7	N12 34.7
Regulus	208 11.9	N12 04.4
Rigel	281 37.5	S 8 13.7
Rigil Kent.	140 28.7	S60 44.3
Sabik	102 43.6	S15 41.7
Schedar	350 10.8	N56 25.3
Shaula	96 58.7	S37 05.2
Sirius	258 57.0	S16 41.3
Spica	158 59.6	S11 02.7
Suhail	223 11.8	S43 20.5
Vega	80 57.5	N38 46.0
Zuben'ubi	137 35.3	S15 56.9

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	106 14.4	11 18
Mars	225 06.8	3 21
Jupiter	267 48.0	0 31
Saturn	206 54.8	4 34

G.M.T.	SUN G.H.A.	SUN Dec.	MOON G.H.A.	MOON v	MOON Dec.	MOON d	MOON H.P.
d h	° ′	° ′	° ′	′	° ′	′	′
15 00	181 15.8	S23 14.9	120 07.0	9.0	S10 23.9	9.4	59.2
01	196 15.5	15.1	134 35.0	9.0	10 14.5	9.5	59.1
02	211 15.2	15.2	149 03.0	9.1	10 05.0	9.5	59.1
03	226 14.9	· · 15.3	163 31.1	9.2	9 55.5	9.5	59.0
04	241 14.6	15.5	177 59.3	9.2	9 46.0	9.6	59.0
05	256 14.3	15.6	192 27.5	9.4	9 36.4	9.6	59.0
06	271 14.0	S23 15.7	206 55.9	9.4	S 9 26.8	9.7	58.9
07	286 13.7	15.9	221 24.3	9.5	9 17.1	9.7	58.9
T 08	301 13.4	16.0	235 52.8	9.6	9 07.4	9.8	58.9
H 09	316 13.1	· · 16.1	250 21.4	9.6	8 57.6	9.7	58.8
U 10	331 12.8	16.3	264 50.0	9.8	8 47.9	9.9	58.8
R 11	346 12.5	16.4	279 18.8	9.8	8 38.0	9.8	58.7
S 12	1 12.2	S23 16.5	293 47.6	9.9	S 8 28.2	9.9	58.7
D 13	16 11.9	16.6	308 16.5	9.9	8 18.3	9.9	58.7
A 14	31 11.6	16.8	322 45.4	10.1	8 08.4	10.0	58.6
Y 15	46 11.3	· · 16.9	337 14.5	10.1	7 58.4	10.0	58.6
16	61 11.0	17.0	351 43.6	10.2	7 48.4	10.0	58.5
17	76 10.7	17.1	6 12.8	10.2	7 38.4	10.1	58.5
18	91 10.4	S23 17.3	20 42.0	10.3	S 7 28.3	10.0	58.5
19	106 10.1	17.4	35 11.3	10.4	7 18.3	10.1	58.4
20	121 09.8	17.5	49 40.7	10.5	7 08.2	10.1	58.4
21	136 09.5	· · 17.6	64 10.2	10.5	6 58.1	10.2	58.3
22	151 09.2	17.7	78 39.7	10.6	6 47.9	10.2	58.3
23	166 08.9	17.9	93 09.3	10.7	6 37.7	10.1	58.3
16 00	181 08.6	S23 18.0	107 39.0	10.8	S 6 27.6	10.3	58.2
01	196 08.3	18.1	122 08.8	10.8	6 17.3	10.2	58.2
02	211 08.0	18.2	136 38.6	10.8	6 07.1	10.2	58.1
03	226 07.7	· · 18.3	151 08.4	11.0	5 56.9	10.3	58.1
04	241 07.4	18.4	165 38.4	11.0	5 46.6	10.3	58.1
05	256 07.1	18.5	180 08.4	11.1	5 36.3	10.3	58.0
06	271 06.8	S23 18.7	194 38.5	11.1	S 5 26.0	10.3	58.0
07	286 06.5	18.8	209 08.6	11.2	5 15.7	10.3	57.9
08	301 06.2	18.9	223 38.8	11.2	5 05.4	10.4	57.9
F 09	316 05.9	· · 19.0	238 09.0	11.4	4 55.0	10.3	57.9
R 10	331 05.6	19.1	252 39.4	11.3	4 44.7	10.4	57.8
I 11	346 05.3	19.2	267 09.7	11.5	4 34.3	10.3	57.8
D 12	1 05.0	S23 19.3	281 40.2	11.5	S 4 24.0	10.4	57.8
A 13	16 04.6	19.4	296 10.7	11.5	4 13.6	10.4	57.7
Y 14	31 04.3	19.5	310 41.2	11.6	4 03.2	10.4	57.7
15	46 04.0	· · 19.6	325 11.8	11.7	3 52.8	10.4	57.6
16	61 03.7	19.7	339 42.5	11.7	3 42.4	10.4	57.6
17	76 03.4	19.8	354 13.2	11.8	3 32.0	10.4	57.6
18	91 03.1	S23 19.9	8 44.0	11.8	S 3 21.6	10.4	57.5
19	106 02.8	20.0	23 14.8	11.9	3 11.2	10.4	57.5
20	121 02.5	20.1	37 45.7	11.9	3 00.8	10.4	57.5
21	136 02.2	· · 20.2	52 16.6	12.0	2 50.4	10.5	57.4
22	151 01.9	20.3	66 47.6	12.1	2 39.9	10.4	57.4
23	166 01.6	20.4	81 18.7	12.0	2 29.5	10.4	57.3
17 00	181 01.3	S23 20.5	95 49.7	12.2	S 2 19.1	10.4	57.3
01	196 01.0	20.6	110 20.9	12.2	2 08.7	10.4	57.3
02	211 00.7	20.7	124 52.1	12.2	1 58.3	10.4	57.2
03	226 00.4	· · 20.8	139 23.3	12.3	1 47.9	10.4	57.2
04	241 00.1	20.9	153 54.6	12.3	1 37.5	10.4	57.2
05	255 59.8	21.0	168 25.9	12.3	1 27.1	10.4	57.1
06	270 59.5	S23 21.1	182 57.2	12.4	S 1 16.7	10.4	57.1
07	285 59.2	21.2	197 28.6	12.5	1 06.3	10.3	57.0
S 08	300 58.9	21.3	212 00.1	12.5	0 56.0	10.4	57.0
A 09	315 58.5	· · 21.4	226 31.6	12.5	0 45.6	10.4	57.0
T 10	330 58.2	21.5	241 03.1	12.6	0 35.2	10.3	56.9
U 11	345 57.9	21.6	255 34.7	12.6	0 24.9	10.3	56.9
R 12	0 57.6	S23 21.6	270 06.3	12.7	S 0 14.6	10.4	56.9
D 13	15 57.3	21.7	284 38.0	12.6	S 0 04.2	10.3	56.8
A 14	30 57.0	21.8	299 09.6	12.8	N 0 06.1	10.3	56.8
Y 15	45 56.7	· · 21.9	313 41.4	12.7	0 16.4	10.3	56.8
16	60 56.4	22.0	328 13.1	12.8	0 26.7	10.2	56.7
17	75 56.1	22.1	342 44.9	12.9	0 36.9	10.3	56.7
18	90 55.8	S23 22.2	357 16.8	12.8	N 0 47.2	10.2	56.7
19	105 55.5	22.2	11 48.6	12.9	0 57.4	10.3	56.6
20	120 55.2	22.3	26 20.5	13.0	1 07.7	10.2	56.6
21	135 54.9	· · 22.4	40 52.5	12.9	1 17.9	10.1	56.6
22	150 54.6	22.5	55 24.4	13.0	1 28.0	10.2	56.5
23	165 54.3	22.6	69 56.4	13.0	1 38.2	10.2	56.5
	S.D. 16.3	*d* 0.1	S.D. 16.0		15.7		15.5

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 15	Moonrise 16	Moonrise 17	Moonrise 18
°	h m	h m	h m	h m	h m	h m	h m
N 72	08 21	10 49	■	12 16	12 10	12 04	11 59
N 70	08 01	09 49	■	12 03	12 04	12 04	12 04
68	07 46	09 15	■	11 53	11 59	12 03	12 08
66	07 33	08 50	10 29	11 44	11 54	12 03	12 11
64	07 22	08 30	09 47	11 37	11 51	12 03	12 14
62	07 12	08 14	09 20	11 31	11 48	12 02	12 17
60	07 04	08 01	08 58	11 25	11 45	12 02	12 19
N 58	06 56	07 49	08 41	11 20	11 42	12 02	12 21
56	06 50	07 39	08 26	11 16	11 40	12 02	12 23
54	06 44	07 30	08 14	11 12	11 38	12 02	12 24
52	06 38	07 22	08 02	11 09	11 36	12 02	12 26
50	06 33	07 14	07 53	11 05	11 35	12 02	12 27
45	06 21	06 58	07 32	10 58	11 31	12 01	12 30
N 40	06 11	06 45	07 15	10 53	11 28	12 01	12 33
35	06 01	06 33	07 01	10 48	11 25	12 01	12 35
30	05 53	06 23	06 49	10 43	11 23	12 01	12 37
20	05 36	06 04	06 28	10 35	11 19	12 00	12 40
N 10	05 20	05 46	06 09	10 28	11 16	12 00	12 43
0	05 03	05 29	05 52	10 22	11 12	12 00	12 46
S 10	04 44	05 11	05 34	10 16	11 09	12 00	12 49
20	04 22	04 51	05 16	10 09	11 05	12 00	12 52
30	03 53	04 26	04 54	10 01	11 01	12 00	12 56
35	03 34	04 11	04 41	09 56	10 59	11 59	12 58
40	03 11	03 53	04 26	09 51	10 57	11 59	13 00
45	02 41	03 30	04 08	09 45	10 53	11 59	13 03
S 50	01 56	03 01	03 45	09 38	10 50	11 59	13 06
52	01 28	02 46	03 34	09 35	10 48	11 59	13 08
54	00 44	02 28	03 22	09 31	10 46	11 59	13 09
56	////	02 06	03 08	09 27	10 44	11 59	13 11
58	////	01 37	02 52	09 22	10 42	11 59	13 13
S 60	////	00 48	02 31	09 17	10 40	11 59	13 15

Lat.	Sunset	Twilight Civil	Twilight Naut.	Moonset 15	Moonset 16	Moonset 17	Moonset 18
°	h m	h m	h m	h m	h m	h m	h m
N 72	■	13 02	15 30	21 14	23 02	24 46	00 46
N 70	■	14 02	15 50	21 25	23 06	24 43	00 43
68	■	14 37	16 05	21 33	23 09	24 41	00 41
66	13 22	15 02	16 18	21 41	23 12	24 39	00 39
64	14 04	15 21	16 29	21 47	23 14	24 38	00 38
62	14 32	15 37	16 39	21 52	23 16	24 37	00 37
60	14 53	15 51	16 47	21 56	23 17	24 35	00 35
N 58	15 10	16 02	16 55	22 00	23 19	24 34	00 34
56	15 25	16 12	17 02	22 04	23 20	24 34	00 34
54	15 38	16 21	17 08	22 07	23 21	24 33	00 33
52	15 49	16 30	17 13	22 10	23 22	24 32	00 32
50	15 59	16 37	17 19	22 12	23 23	24 31	00 31
45	16 19	16 53	17 30	22 18	23 25	24 30	00 30
N 40	16 36	17 06	17 41	22 23	23 27	24 29	00 29
35	16 50	17 18	17 50	22 27	23 28	24 28	00 28
30	17 02	17 29	17 59	22 30	23 30	24 27	00 27
20	17 24	17 48	18 15	22 36	23 32	24 25	00 25
N 10	17 42	18 05	18 31	22 41	23 34	24 24	00 24
0	17 59	18 22	18 48	22 46	23 35	24 22	00 22
S 10	18 17	18 40	19 07	22 51	23 37	24 21	00 21
20	18 36	19 00	19 30	22 56	23 39	24 19	00 19
30	18 58	19 25	19 59	23 02	23 41	24 18	00 18
35	19 11	19 40	20 17	23 05	23 42	24 17	00 17
40	19 26	19 59	20 40	23 09	23 43	24 16	00 16
45	19 44	20 21	21 11	23 14	23 45	24 14	00 14
S 50	20 06	20 51	21 56	23 19	23 47	24 13	00 13
52	20 17	21 06	22 24	23 21	23 48	24 12	00 12
54	20 29	21 24	23 09	23 24	23 48	24 12	00 12
56	20 43	21 46	////	23 26	23 49	24 11	00 11
58	21 00	22 15	////	23 30	23 50	24 10	00 10
S 60	21 21	23 05	////	23 33	23 52	24 09	00 09

Day	SUN Eqn. of Time 00ʰ	SUN Eqn. of Time 12ʰ	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
	m s	m s	h m	h m	h m	d	
15	05 04	04 50	11 55	16 34	04 08	05	
16	04 35	04 20	11 56	17 24	04 59	06	◐
17	04 06	03 51	11 56	18 11	05 48	07	

1977 DECEMBER 18, 19, 20 (SUN., MON., TUES.)

G.M.T.	ARIES	VENUS −3.4		MARS −0.5		JUPITER −2.3		SATURN +0.7	
	G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
d h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
18 00	86 29.6	190 02.1	S22 35.3	311 41.7	N20 30.2	354 35.1	N23 09.6	293 25.4	N12 34.3
01	101 32.0	205 01.2	35.7	326 44.3	30.4	9 37.9	09.6	308 27.9	34.4
02	116 34.5	220 00.2	36.1	341 46.9	30.5	24 40.8	09.6	323 30.3	34.4
03	131 37.0	234 59.3	·· 36.5	356 49.6	·· 30.7	39 43.6	·· 09.6	338 32.8	·· 34.4
04	146 39.4	249 58.4	36.9	11 52.2	30.8	54 46.4	09.6	353 35.3	34.4
05	161 41.9	264 57.5	37.3	26 54.8	31.0	69 49.3	09.6	8 37.8	34.4
06	176 44.4	279 56.6	S22 37.7	41 57.4	N20 31.2	84 52.1	N23 09.6	23 40.3	N12 34.5
07	191 46.8	294 55.6	38.1	57 00.0	31.3	99 54.9	09.6	38 42.8	34.5
08	206 49.3	309 54.7	38.4	72 02.7	31.5	114 57.8	09.6	53 45.3	34.5
S 09	221 51.7	324 53.8	·· 38.8	87 05.3	·· 31.6	130 00.6	·· 09.7	68 47.8	·· 34.5
U 10	236 54.2	339 52.9	39.2	102 07.9	31.8	145 03.4	09.7	83 50.3	34.5
N 11	251 56.7	354 52.0	39.6	117 10.5	32.0	160 06.2	09.7	98 52.8	34.6
D 12	266 59.1	9 51.0	S22 40.0	132 13.2	N20 32.1	175 09.1	N23 09.7	113 55.3	N12 34.6
A 13	282 01.6	24 50.1	40.3	147 15.8	32.3	190 11.9	09.7	128 57.7	34.6
Y 14	297 04.1	39 49.2	40.7	162 18.4	32.5	205 14.7	09.7	144 00.2	34.6
15	312 06.5	54 48.3	·· 41.1	177 21.1	·· 32.6	220 17.6	·· 09.7	159 02.7	·· 34.7
16	327 09.0	69 47.3	41.5	192 23.7	32.8	235 20.4	09.7	174 05.2	34.7
17	342 11.5	84 46.4	41.8	207 26.3	32.9	250 23.2	09.7	189 07.7	34.7
18	357 13.9	99 45.5	S22 42.2	222 29.0	N20 33.1	265 26.1	N23 09.7	204 10.2	N12 34.7
19	12 16.4	114 44.6	42.6	237 31.6	33.3	280 28.9	09.8	219 12.7	34.7
20	27 18.9	129 43.7	43.0	252 34.2	33.4	295 31.7	09.8	234 15.2	34.8
21	42 21.3	144 42.7	·· 43.3	267 36.9	·· 33.6	310 34.6	·· 09.8	249 17.7	·· 34.8
22	57 23.8	159 41.8	43.7	282 39.5	33.8	325 37.4	09.8	264 20.2	34.8
23	72 26.2	174 40.9	44.1	297 42.2	33.9	340 40.2	09.8	279 22.7	34.8
19 00	87 28.7	189 40.0	S22 44.4	312 44.8	N20 34.1	355 43.1	N23 09.8	294 25.2	N12 34.8
01	102 31.2	204 39.0	44.8	327 47.5	34.3	10 45.9	09.8	309 27.7	34.9
02	117 33.6	219 38.1	45.2	342 50.1	34.4	25 48.7	09.8	324 30.2	34.9
03	132 36.1	234 37.2	·· 45.5	357 52.8	·· 34.6	40 51.5	·· 09.8	339 32.7	·· 34.9
04	147 38.6	249 36.2	45.9	12 55.4	34.8	55 54.4	09.8	354 35.1	34.9
05	162 41.0	264 35.3	46.2	27 58.1	34.9	70 57.2	09.9	9 37.6	34.9
06	177 43.5	279 34.4	S22 46.6	43 00.7	N20 35.1	86 00.0	N23 09.9	24 40.1	N12 35.0
07	192 46.0	294 33.5	47.0	58 03.4	35.3	101 02.9	09.9	39 42.6	35.0
08	207 48.4	309 32.5	47.3	73 06.0	35.4	116 05.7	09.9	54 45.1	35.0
M 09	222 50.9	324 31.6	·· 47.7	88 08.7	·· 35.6	131 08.5	·· 09.9	69 47.6	·· 35.0
O 10	237 53.3	339 30.7	48.0	103 11.3	35.8	146 11.4	09.9	84 50.1	35.1
N 11	252 55.8	354 29.8	48.4	118 14.0	35.9	161 14.2	09.9	99 52.6	35.1
D 12	267 58.3	9 28.8	S22 48.7	133 16.7	N20 36.1	176 17.0	N23 09.9	114 55.1	N12 35.1
A 13	283 00.7	24 27.9	49.1	148 19.3	36.3	191 19.9	09.9	129 57.6	35.1
Y 14	298 03.2	39 27.0	49.4	163 22.0	36.5	206 22.7	09.9	145 00.1	35.1
15	313 05.7	54 26.0	·· 49.8	178 24.7	·· 36.6	221 25.5	·· 10.0	160 02.6	·· 35.2
16	328 08.1	69 25.1	50.1	193 27.3	36.8	236 28.4	10.0	175 05.1	35.2
17	343 10.6	84 24.2	50.5	208 30.0	37.0	251 31.2	10.0	190 07.6	35.2
18	358 13.1	99 23.2	S22 50.8	223 32.7	N20 37.1	266 34.0	N23 10.0	205 10.1	N12 35.2
19	13 15.5	114 22.3	51.1	238 35.4	37.3	281 36.9	10.0	220 12.6	35.3
20	28 18.0	129 21.4	51.5	253 38.0	37.5	296 39.7	10.0	235 15.1	35.3
21	43 20.5	144 20.5	·· 51.8	268 40.7	·· 37.7	311 42.5	·· 10.0	250 17.6	·· 35.3
22	58 22.9	159 19.5	52.2	283 43.4	37.8	326 45.4	10.0	265 20.1	35.3
23	73 25.4	174 18.6	52.5	298 46.1	38.0	341 48.2	10.0	280 22.6	35.3
20 00	88 27.8	189 17.7	S22 52.8	313 48.7	N20 38.2	356 51.0	N23 10.0	295 25.1	N12 35.4
01	103 30.3	204 16.7	53.2	328 51.4	38.4	11 53.9	10.0	310 27.6	35.4
02	118 32.8	219 15.8	53.5	343 54.1	38.5	26 56.7	10.1	325 30.1	35.4
03	133 35.2	234 14.9	·· 53.8	358 56.8	·· 38.7	41 59.5	·· 10.1	340 32.6	·· 35.4
04	148 37.7	249 13.9	54.2	13 59.5	38.9	57 02.4	10.1	355 35.1	35.5
05	163 40.2	264 13.0	54.5	29 02.2	39.1	72 05.2	10.1	10 37.6	35.5
06	178 42.6	279 12.1	S22 54.8	44 04.9	N20 39.3	87 08.0	N23 10.1	25 40.1	N12 35.5
07	193 45.1	294 11.1	55.2	59 07.5	39.4	102 10.9	10.1	40 42.6	35.5
T 08	208 47.6	309 10.2	55.5	74 10.2	39.6	117 13.7	10.1	55 45.1	35.5
U 09	223 50.0	324 09.3	·· 55.8	89 12.9	·· 39.8	132 16.5	·· 10.1	70 47.6	·· 35.6
E 10	238 52.5	339 08.3	56.1	104 15.6	40.0	147 19.3	10.1	85 50.1	35.6
S 11	253 55.0	354 07.4	56.5	119 18.3	40.1	162 22.2	10.1	100 52.6	35.6
D 12	268 57.4	9 06.5	S22 56.8	134 21.0	N20 40.3	177 25.0	N23 10.2	115 55.1	N12 35.6
A 13	283 59.9	24 05.5	57.1	149 23.7	40.5	192 27.8	10.2	130 57.6	35.7
Y 14	299 02.3	39 04.6	57.4	164 26.4	40.7	207 30.7	10.2	146 00.1	35.7
15	314 04.8	54 03.6	·· 57.7	179 29.1	·· 40.9	222 33.5	·· 10.2	161 02.6	·· 35.7
16	329 07.3	69 02.7	58.1	194 31.8	41.1	237 36.3	10.2	176 05.1	35.7
17	344 09.7	84 01.8	58.4	209 34.5	41.2	252 39.2	10.2	191 07.6	35.8
18	359 12.2	99 00.8	S22 58.7	224 37.3	N20 41.4	267 42.0	N23 10.2	206 10.1	N12 35.8
19	14 14.7	113 59.9	59.0	239 40.0	41.6	282 44.8	10.2	221 12.6	35.8
20	29 17.1	128 59.0	59.3	254 42.7	41.8	297 47.7	10.2	236 15.1	35.8
21	44 19.6	143 58.0	·· 59.6	269 45.4	·· 42.0	312 50.5	·· 10.2	251 17.6	·· 35.9
22	59 22.1	158 57.1	22 59.9	284 48.1	42.1	327 53.3	10.2	266 20.1	35.9
23	74 24.5	173 56.1	23 00.2	299 50.8	42.3	342 56.2	10.3	281 22.6	35.9
Mer. Pass.	h m 18 07.1	v −0.9	d 0.4	v 2.7	d 0.2	v 2.8	d 0.0	v 2.5	d 0.0

STARS		
Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 38.4	S40 23.8
Achernar	335 46.5	S57 21.2
Acrux	173 39.3	S62 58.3
Adhara	255 33.2	S28 56.6
Aldebaran	291 19.8	N16 27.9
Alioth	166 44.4	N56 04.5
Alkaid	153 20.3	N49 25.2
Al Na'ir	28 17.6	S47 04.2
Alnilam	276 13.2	S 1 13.0
Alphard	218 22.2	S 8 33.8
Alphecca	126 34.0	N26 47.3
Alpheratz	358 11.2	N28 58.3
Altair	62 34.6	N 8 48.7
Ankaa	353 42.1	S42 25.8
Antares	112 59.5	S26 22.9
Arcturus	146 20.4	N19 17.8
Atria	108 25.9	S68 59.1
Avior	234 28.3	S59 26.3
Bellatrix	279 00.4	N 6 19.7
Betelgeuse	271 29.9	N 7 24.1
Canopus	264 07.5	S52 41.1
Capella	281 13.5	N45 58.5
Deneb	49 50.0	N45 12.4
Denebola	183 00.9	N14 41.6
Diphda	349 22.7	S18 06.5
Dubhe	194 24.4	N61 51.9
Elnath	278 46.1	N28 35.3
Eltanin	90 59.1	N51 29.6
Enif	34 13.6	N 9 46.6
Fomalhaut	15 53.6	S29 44.5
Gacrux	172 30.8	S56 59.1
Gienah	176 19.9	S17 25.1
Hadar	149 26.2	S60 15.7
Hamal	328 30.8	N23 21.6
Kaus Aust.	84 19.7	S34 23.6
Kochab	137 20.0	N74 14.6
Markab	14 05.1	N15 05.3
Menkar	314 42.8	N 4 00.2
Menkent	148 39.4	S36 15.5
Miaplacidus	221 44.6	S69 37.5
Mirfak	309 18.3	N49 47.1
Nunki	76 31.8	S26 19.4
Peacock	54 01.9	S56 48.5
Pollux	244 00.1	N28 04.6
Procyon	245 27.4	N 5 16.8
Rasalhague	96 31.7	N12 34.7
Regulus	208 11.8	N12 04.4
Rigel	281 37.5	S 8 13.7
Rigil Kent.	140 28.7	S60 44.3
Sabik	102 43.6	S15 41.8
Schedar	350 10.9	N56 25.3
Shaula	96 58.7	S37 05.2
Sirius	258 57.0	S16 41.3
Spica	158 59.6	S11 02.7
Suhail	223 11.8	S43 20.5
Vega	80 57.5	N38 46.0
Zuben'ubi	137 35.3	S15 56.9

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	102 11.2	11 22
Mars	225 16.1	3 08
Jupiter	268 14.3	0 17
Saturn	206 56.5	4 22

	G.M.T.	SUN G.H.A.	SUN Dec.	MOON G.H.A.	MOON v	MOON Dec.	MOON d	MOON H.P.
	d h	° ′	° ′	° ′	′	° ′	′	′
	18 00	180 53.9	S23 22.6	84 28.4	13.1	N 1 48.4	10.1	56.5
	01	195 53.6	22.7	99 00.5	13.1	1 58.5	10.1	56.4
	02	210 53.3	22.8	113 32.6	13.1	2 08.6	10.1	56.4
	03	225 53.0	·· 22.9	128 04.7	13.1	2 18.7	10.1	56.4
	04	240 52.7	22.9	142 .36.8	13.2	2 28.8	10.0	56.3
	05	255 52.4	23.0	157 09.0	13.2	2 38.8	10.0	56.3
	06	270 52.1	S23 23.1	171 41.2	13.2	N 2 48.8	10.0	56.3
	07	285 51.8	23.2	186 13.4	13.2	2 58.8	10.0	56.2
	08	300 51.5	23.2	200 45.6	13.3	3 08.8	9.9	56.2
S	09	315 51.2	·· 23.3	215 17.9	13.2	3 18.7	9.9	56.2
U	10	330 50.9	23.4	229 50.1	13.3	3 28.6	9.9	56.1
N	11	345 50.6	23.5	244 22.4	13.4	3 38.5	9.9	56.1
D	12	0 50.3	S23 23.5	258 54.8	13.3	N 3 48.4	9.8	56.1
A	13	15 50.0	23.6	273 27.1	13.4	3 58.2	9.9	56.1
Y	14	30 49.6	23.7	287 59.5	13.4	4 08.1	9.7	56.0
	15	45 49.3	·· 23.7	302 31.9	13.4	4 17.8	9.8	56.0
	16	60 49.0	23.8	317 04.3	13.4	4 27.6	9.7	56.0
	17	75 48.7	23.8	331 36.7	13.4	4 37.3	9.7	55.9
	18	90 48.4	S23 23.9	346 09.1	13.4	N 4 47.0	9.7	55.9
	19	105 48.1	24.0	0 41.5	13.5	4 56.7	9.6	55.9
	20	120 47.8	24.0	15 14.0	13.5	5 06.3	9.6	55.8
	21	135 47.5	·· 24.1	29 46.5	13.5	5 15.9	9.5	55.8
	22	150 47.2	24.2	44 19.0	13.5	5 25.4	9.6	55.8
	23	165 46.9	24.2	58 51.5	13.5	5 35.0	9.5	55.8
	19 00	180 46.6	S23 24.3	73 24.0	13.5	N 5 44.5	9.4	55.7
	01	195 46.3	24.3	87 56.5	13.6	5 53.9	9.4	55.7
	02	210 45.9	24.4	102 29.1	13.5	6 03.3	9.4	55.7
	03	225 45.6	·· 24.4	117 01.6	13.6	6 12.7	9.4	55.7
	04	240 45.3	24.5	131 34.2	13.5	6 22.1	9.3	55.6
	05	255 45.0	24.6	146 06.7	13.6	6 31.4	9.3	55.6
	06	270 44.7	S23 24.6	160 39.3	13.6	N 6 40.7	9.2	55.6
	07	285 44.4	24.7	175 11.9	13.6	6 49.9	9.2	55.5
	08	300 44.1	24.7	189 44.5	13.6	6 59.1	9.2	55.5
M	09	315 43.8	·· 24.8	204 17.1	13.6	7 08.3	9.1	55.5
O	10	330 43.5	24.8	218 49.7	13.6	7 17.4	9.1	55.5
N	11	345 43.2	24.9	233 22.3	13.6	7 26.5	9.0	55.4
D	12	0 42.9	S23 24.9	247 54.9	13.6	N 7 35.5	9.0	55.4
A	13	15 42.5	25.0	262 27.5	13.6	7 44.5	9.0	55.4
Y	14	30 42.2	25.0	277 00.1	13.6	7 53.5	8.9	55.4
	15	45 41.9	·· 25.1	291 32.7	13.7	8 02.4	8.9	55.3
	16	60 41.6	25.1	306 05.4	13.6	8 11.3	8.8	55.3
	17	75 41.3	25.2	320 38.0	13.6	8 20.1	8.8	55.3
	18	90 41.0	S23 25.2	335 10.6	13.6	N 8 28.9	8.7	55.3
	19	105 40.7	25.2	349 43.2	13.7	8 37.6	8.7	55.3
	20	120 40.4	25.3	4 15.9	13.6	8 46.3	8.7	55.2
	21	135 40.1	·· 25.3	18 48.5	13.6	8 55.0	8.6	55.2
	22	150 39.8	25.4	33 21.1	13.7	9 03.6	8.6	55.2
	23	165 39.5	25.4	47 53.8	13.6	9 12.2	8.5	55.2
	20 00	180 39.1	S23 25.4	62 26.4	13.6	N 9 20.7	8.4	55.1
	01	195 38.8	25.5	76 59.0	13.6	9 29.1	8.4	55.1
	02	210 38.5	25.5	91 31.6	13.6	9 37.5	8.4	55.1
	03	225 38.2	·· 25.6	106 04.2	13.6	9 45.9	8.3	55.1
	04	240 37.9	25.6	120 36.8	13.6	9 54.2	8.3	55.1
	05	255 37.6	25.6	135 09.4	13.6	10 02.5	8.2	55.0
	06	270 37.3	S23 25.7	149 42.0	13.6	N10 10.7	8.2	55.0
	07	285 37.0	25.7	164 14.6	13.6	10 18.9	8.1	55.0
	08	300 36.7	25.7	178 47.2	13.6	10 27.0	8.1	55.0
T	09	315 36.4	·· 25.8	193 19.8	13.6	10 35.1	8.0	54.9
U	10	330 36.1	25.8	207 52.4	13.6	10 43.1	8.0	54.9
E	11	345 35.7	25.8	222 25.0	13.5	10 51.1	7.9	54.9
S	12	0 35.4	S23 25.9	236 57.5	13.6	N10 59.0	7.8	54.9
D	13	15 35.1	25.9	251 30.1	13.5	11 06.8	7.8	54.9
A	14	30 34.8	25.9	266 02.6	13.6	11 14.6	7.8	54.9
Y	15	45 34.5	·· 25.9	280 35.2	13.5	11 22.4	7.7	54.8
	16	60 34.2	26.0	295 07.7	13.5	11 30.1	7.6	54.8
	17	75 33.9	26.0	309 40.2	13.5	11 37.7	7.6	54.8
	18	90 33.6	S23 26.0	324 12.7	13.5	N11 45.3	7.5	54.8
	19	105 33.3	26.0	338 45.2	13.5	11 52.8	7.5	54.8
	20	120 33.0	26.1	353 17.7	13.5	12 00.3	7.4	54.7
	21	135 32.6	·· 26.1	7 50.2	13.4	12 07.7	7.4	54.7
	22	150 32.3	26.1	22 22.6	13.5	12 15.1	7.3	54.7
	23	165 32.0	26.1	36 55.1	13.4	12 22.4	7.2	54.7
		S.D. 16.3	*d* 0.0	S.D. 15.3		15.1		15.0

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 18	Moonrise 19	Moonrise 20	Moonrise 21
°	h m	h m	h m	h m	h m	h m	h m
N 72	08 24	10 56	■	11 59	11 53	11 47	11 41
N 70	08 04	09 53	■	12 04	12 04	12 05	12 07
68	07 48	09 18	■	12 08	12 13	12 19	12 27
66	07 35	08 52	10 33	12 11	12 20	12 30	12 43
64	07 24	08 33	09 51	12 14	12 26	12 40	12 56
62	07 15	08 17	09 22	12 17	12 32	12 48	13 08
60	07 06	08 03	09 01	12 19	12 36	12 55	13 17
N 58	06 59	07 51	08 43	12 21	12 40	13 02	13 26
56	06 52	07 41	08 28	12 23	12 44	13 07	13 33
54	06 46	07 32	08 16	12 24	12 48	13 12	13 40
52	06 40	07 24	08 05	12 26	12 51	13 17	13 45
50	06 35	07 16	07 55	12 27	12 53	13 21	13 51
45	06 23	07 00	07 34	12 30	13 00	13 30	14 03
N 40	06 13	06 47	07 17	12 33	13 05	13 37	14 12
35	06 03	06 35	07 03	12 35	13 09	13 44	14 21
30	05 54	06 24	06 51	12 37	13 13	13 50	14 28
20	05 38	06 05	06 29	12 40	13 20	14 00	14 41
N 10	05 22	05 48	06 11	12 43	13 26	14 08	14 52
0	05 05	05 31	05 53	12 46	13 32	14 17	15 02
S 10	04 46	05 13	05 36	12 49	13 37	14 25	15 13
20	04 23	04 52	05 17	12 52	13 43	14 34	15 24
30	03 54	04 27	04 55	12 56	13 50	14 44	15 37
35	03 35	04 12	04 42	12 58	13 55	14 50	15 45
40	03 12	03 54	04 27	13 00	13 59	14 57	15 53
45	02 41	03 31	04 09	13 03	14 05	15 05	16 03
S 50	01 56	03 01	03 46	13 06	14 11	15 14	16 16
52	01 28	02 46	03 35	13 08	14 14	15 19	16 21
54	00 41	02 28	03 23	13 09	14 17	15 24	16 28
56	////	02 06	03 09	13 11	14 21	15 29	16 35
58	////	01 36	02 52	13 13	14 25	15 35	16 43
S 60	////	00 46	02 31	13 15	14 30	15 42	16 52

Lat.	Sunset	Twilight Civil	Twilight Naut.	Moonset 18	Moonset 19	Moonset 20	Moonset 21
°	h m	h m	h m	h m	h m	h m	h m
N 72	■	12 59	15 30	00 46	02 27	04 06	05 47
N 70	■	14 01	15 50	00 43	02 18	03 50	05 22
68	■	14 37	16 06	00 41	02 10	03 37	05 03
66	13 21	15 02	16 19	00 39	02 04	03 27	04 47
64	14 04	15 22	16 30	00 38	01 59	03 18	04 35
62	14 32	15 38	16 40	00 37	01 55	03 11	04 24
60	14 53	15 51	16 48	00 35	01 51	03 04	04 15
N 58	15 11	16 03	16 56	00 34	01 48	02 59	04 08
56	15 26	16 13	17 02	00 34	01 45	02 54	04 01
54	15 38	16 22	17 09	00 33	01 42	02 49	03 54
52	15 50	16 31	17 14	00 32	01 40	02 45	03 49
50	15 59	16 38	17 20	00 31	01 37	02 42	03 44
45	16 20	16 54	17 31	00 30	01 33	02 34	03 33
N 40	16 37	17 08	17 42	00 29	01 29	02 27	03 24
35	16 51	17 19	17 51	00 28	01 25	02 21	03 17
30	17 04	17 30	18 00	00 27	01 22	02 16	03 10
20	17 25	17 49	18 16	00 25	01 17	02 08	02 58
N 10	17 43	18 06	18 33	00 24	01 12	02 00	02 48
0	18 01	18 23	18 50	00 22	01 08	01 53	02 39
S 10	18 18	18 42	19 09	00 21	01 04	01 46	02 29
20	18 37	19 02	19 31	00 19	00 59	01 39	02 19
30	19 00	19 27	20 00	00 18	00 54	01 30	02 08
35	19 13	19 42	20 19	00 17	00 51	01 25	02 01
40	19 28	20 01	20 42	00 16	00 47	01 20	01 53
45	19 46	20 23	21 13	00 14	00 44	01 13	01 45
S 50	20 08	20 53	21 59	00 13	00 39	01 06	01 34
52	20 19	21 08	22 27	00 12	00 37	01 02	01 29
54	20 32	21 26	23 14	00 12	00 34	00 58	01 24
56	20 46	21 48	////	00 11	00 32	00 54	01 18
58	21 03	22 18	////	00 10	00 29	00 49	01 11
S 60	21 23	23 09	////	00 09	00 26	00 44	01 04

Day	SUN Eqn. of Time 00ʰ	SUN Eqn. of Time 12ʰ	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
	m s	m s	h m	h m	h m	d	
18	03 36	03 22	11 57	18 57	06 34	08	◐
19	03 07	02 52	11 57	19 42	07 20	09	
20	02 37	02 22	11 58	20 28	08 05	10	

	G.M.T.	ARIES	VENUS −3.4		MARS −0.6		JUPITER −2.3		SATURN +0.6	
		G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
	d h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
	21 00	89 27.0	188 55.2	S23 00.5	314 53.5	N20 42.5	357 59.0	N23 10.3	296 25.1	N12 35.9
	01	104 29.4	203 54.3	00.8	329 56.2	42.7	13 01.8	10.3	311 27.6	36.0
	02	119 31.9	218 53.3	01.2	344 59.0	42.9	28 04.7	10.3	326 30.1	36.0
	03	134 34.4	233 52.4	·· 01.5	0 01.7	·· 43.1	43 07.5	·· 10.3	341 32.6	·· 36.0
	04	149 36.8	248 51.4	01.8	15 04.4	43.3	58 10.3	10.3	356 35.1	36.0
	05	164 39.3	263 50.5	02.1	30 07.1	43.4	73 13.2	10.3	11 37.6	36.1
	06	179 41.8	278 49.6	S23 02.4	45 09.9	N20 43.6	88 16.0	N23 10.3	26 40.1	N12 36.1
W	07	194 44.2	293 48.6	02.7	60 12.6	43.8	103 18.8	10.3	41 42.6	36.1
E	08	209 46.7	308 47.7	03.0	75 15.3	44.0	118 21.7	10.3	56 45.1	36.1
D	09	224 49.2	323 46.7	·· 03.3	90 18.0	·· 44.2	133 24.5	·· 10.4	71 47.6	·· 36.2
N	10	239 51.6	338 45.8	03.6	105 20.8	44.4	148 27.3	10.4	86 50.1	36.2
E	11	254 54.1	353 44.9	03.8	120 23.5	44.6	163 30.2	10.4	101 52.6	36.2
S	12	269 56.6	8 43.9	S23 04.1	135 26.2	N20 44.8	178 33.0	N23 10.4	116 55.1	N12 36.2
D	13	284 59.0	23 43.0	04.4	150 29.0	45.0	193 35.8	10.4	131 57.6	36.3
A	14	300 01.5	38 42.0	04.7	165 31.7	45.1	208 38.7	10.4	147 00.2	36.3
Y	15	315 03.9	53 41.1	·· 05.0	180 34.5	·· 45.3	223 41.5	·· 10.4	162 02.7	·· 36.3
	16	330 06.4	68 40.2	05.3	195 37.2	45.5	238 44.3	10.4	177 05.2	36.3
	17	345 08.9	83 39.2	05.6	210 39.9	45.7	253 47.2	10.4	192 07.7	36.4
	18	0 11.3	98 38.3	S23 05.9	225 42.7	N20 45.9	268 50.0	N23 10.4	207 10.2	N12 36.4
	19	15 13.8	113 37.3	06.2	240 45.4	46.1	283 52.8	10.4	222 12.7	36.4
	20	30 16.3	128 36.4	06.4	255 48.2	46.3	298 55.7	10.5	237 15.2	36.4
	21	45 18.7	143 35.4	·· 06.7	270 50.9	·· 46.5	313 58.5	·· 10.5	252 17.7	·· 36.5
	22	60 21.2	158 34.5	07.0	285 53.7	46.7	329 01.3	10.5	267 20.2	36.5
	23	75 23.7	173 33.5	07.3	300 56.4	46.9	344 04.2	10.5	282 22.7	36.5
	22 00	90 26.1	188 32.6	S23 07.6	315 59.2	N20 47.1	359 07.0	N23 10.5	297 25.2	N12 36.5
	01	105 28.6	203 31.7	07.8	331 01.9	47.3	14 09.8	10.5	312 27.7	36.6
	02	120 31.1	218 30.7	08.1	346 04.7	47.5	29 12.7	10.5	327 30.2	36.6
	03	135 33.5	233 29.8	·· 08.4	1 07.4	·· 47.6	44 15.5	·· 10.5	342 32.7	·· 36.6
	04	150 36.0	248 28.8	08.7	16 10.2	47.8	59 18.4	10.5	357 35.2	36.6
	05	165 38.4	263 27.9	08.9	31 13.0	48.0	74 21.2	10.5	12 37.8	36.7
	06	180 40.9	278 26.9	S23 09.2	46 15.7	N20 48.2	89 24.0	N23 10.5	27 40.3	N12 36.7
	07	195 43.4	293 26.0	09.5	61 18.5	48.4	104 26.9	10.6	42 42.8	36.7
T	08	210 45.8	308 25.0	09.7	76 21.3	48.6	119 29.7	10.6	57 45.3	36.7
H	09	225 48.3	323 24.1	·· 10.0	91 24.0	·· 48.8	134 32.5	·· 10.6	72 47.8	·· 36.8
U	10	240 50.8	338 23.1	10.3	106 26.8	49.0	149 35.4	10.6	87 50.3	36.8
R	11	255 53.2	353 22.2	10.5	121 29.6	49.2	164 38.2	10.6	102 52.8	36.8
S	12	270 55.7	8 21.2	S23 10.8	136 32.3	N20 49.4	179 41.0	N23 10.6	117 55.3	N12 36.8
D	13	285 58.2	23 20.3	11.1	151 35.1	49.6	194 43.9	10.6	132 57.8	36.9
A	14	301 00.6	38 19.4	11.3	166 37.9	49.8	209 46.7	10.6	148 00.3	36.9
Y	15	316 03.1	53 18.4	·· 11.6	181 40.6	·· 50.0	224 49.5	·· 10.6	163 02.8	·· 36.9
	16	331 05.5	68 17.5	11.8	196 43.4	50.2	239 52.4	10.6	178 05.4	37.0
	17	346 08.0	83 16.5	12.1	211 46.2	50.4	254 55.2	10.6	193 07.9	37.0
	18	1 10.5	98 15.6	S23 12.3	226 49.0	N20 50.6	269 58.0	N23 10.7	208 10.4	N12 37.0
	19	16 12.9	113 14.6	12.6	241 51.8	50.8	285 00.9	10.7	223 12.9	37.0
	20	31 15.4	128 13.7	12.9	256 54.5	51.0	300 03.7	10.7	238 15.4	37.1
	21	46 17.9	143 12.7	·· 13.1	271 57.3	·· 51.2	315 06.5	·· 10.7	253 17.9	·· 37.1
	22	61 20.3	158 11.8	13.4	287 00.1	51.4	330 09.4	10.7	268 20.4	37.1
	23	76 22.8	173 10.8	13.6	302 02.9	51.6	345 12.2	10.7	283 22.9	37.1
	23 00	91 25.3	188 09.9	S23 13.9	317 05.7	N20 51.8	0 15.0	N23 10.7	298 25.4	N12 37.2
	01	106 27.7	203 08.9	14.1	332 08.5	52.0	15 17.9	10.7	313 28.0	37.2
	02	121 30.2	218 08.0	14.4	347 11.3	52.2	30 20.7	10.7	328 30.5	37.2
	03	136 32.7	233 07.0	·· 14.6	2 14.1	·· 52.4	45 23.5	·· 10.7	343 33.0	·· 37.3
	04	151 35.1	248 06.1	14.8	17 16.9	52.6	60 26.4	10.7	358 35.5	37.3
	05	166 37.6	263 05.1	15.1	32 19.6	52.8	75 29.2	10.7	13 38.0	37.3
	06	181 40.0	278 04.2	S23 15.3	47 22.4	N20 53.0	90 32.0	N23 10.8	28 40.5	N12 37.3
	07	196 42.5	293 03.2	15.6	62 25.2	53.2	105 34.9	10.8	43 43.0	37.4
	08	211 45.0	308 02.3	15.8	77 28.0	53.5	120 37.7	10.8	58 45.5	37.4
F	09	226 47.4	323 01.3	·· 16.0	92 30.8	·· 53.7	135 40.5	·· 10.8	73 48.1	·· 37.4
R	10	241 49.9	338 00.3	16.3	107 33.7	53.9	150 43.4	10.8	88 50.6	37.5
I	11	256 52.4	352 59.4	16.5	122 36.5	54.1	165 46.2	10.8	103 53.1	37.5
D	12	271 54.8	7 58.4	S23 16.7	137 39.3	N20 54.3	180 49.0	N23 10.8	118 55.6	N12 37.5
A	13	286 57.3	22 57.5	17.0	152 42.1	54.5	195 51.9	10.8	133 58.1	37.5
Y	14	301 59.8	37 56.5	17.2	167 44.9	54.7	210 54.7	10.8	149 00.6	37.6
	15	317 02.2	52 55.6	·· 17.4	182 47.7	·· 54.9	225 57.5	·· 10.8	164 03.1	·· 37.6
	16	332 04.7	67 54.6	17.7	197 50.5	55.1	241 00.4	10.8	179 05.7	37.6
	17	347 07.2	82 53.7	17.9	212 53.3	55.3	256 03.2	10.9	194 08.2	37.7
	18	2 09.6	97 52.7	S23 18.1	227 56.1	N20 55.5	271 06.0	N23 10.9	209 10.7	N12 37.7
	19	17 12.1	112 51.8	18.3	242 58.9	55.7	286 08.9	10.9	224 13.2	37.7
	20	32 14.5	127 50.8	18.6	258 01.8	55.9	301 11.7	10.9	239 15.7	37.7
	21	47 17.0	142 49.9	·· 18.8	273 04.6	·· 56.2	316 14.5	·· 10.9	254 18.2	·· 37.8
	22	62 19.5	157 48.9	19.0	288 07.4	56.4	331 17.4	10.9	269 20.7	37.8
	23	77 21.9	172 48.0	19.2	303 10.2	56.6	346 20.2	10.9	284 23.3	37.8
	Mer. Pass.	h m 17 55.3	v −0.9	d 0.3	v 2.8	d 0.2	v 2.8	d 0.0	v 2.5	d 0.0

STARS		
Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 38.4	S40 23.8
Achernar	335 46.5	S57 21.2
Acrux	173 39.2	S62 58.3
Adhara	255 33.2	S28 56.6
Aldebaran	291 19.8	N16 27.9
Alioth	166 44.4	N56 04.5
Alkaid	153 20.3	N49 25.2
Al Na'ir	28 17.6	S47 04.2
Alnilam	276 13.2	S 1 13.1
Alphard	218 22.2	S 8 33.8
Alphecca	126 34.0	N26 47.3
Alpheratz	358 11.2	N28 58.3
Altair	62 34.6	N 8 48.7
Ankaa	353 42.1	S42 25.8
Antares	112 59.5	S26 22.9
Arcturus	146 20.4	N19 17.8
Atria	108 25.9	S68 59.1
Avior	234 28.3	S59 26.3
Bellatrix	279 00.4	N 6 19.7
Betelgeuse	271 29.9	N 7 24.1
Canopus	264 07.5	S52 41.1
Capella	281 13.5	N45 58.5
Deneb	49 50.0	N45 12.4
Denebola	183 00.9	N14 41.6
Diphda	349 22.7	S18 06.6
Dubhe	194 24.4	N61 51.9
Elnath	278 46.1	N28 35.3
Eltanin	90 59.1	N51 29.6
Enif	34 13.6	N 9 46.6
Fomalhaut	15 53.6	S29 44.5
Gacrux	172 30.8	S56 59.1
Gienah	176 19.9	S17 25.1
Hadar	149 26.2	S60 15.7
Hamal	328 30.8	N23 21.6
Kaus Aust.	84 19.7	S34 23.6
Kochab	137 20.0	N74 14.6
Markab	14 05.1	N15 05.3
Menkar	314 42.8	N 4 00.2
Menkent	148 39.4	S36 15.5
Miaplacidus	221 44.5	S69 37.5
Mirfak	309 18.3	N49 47.1
Nunki	76 31.8	S26 19.4
Peacock	54 01.9	S56 48.4
Pollux	244 00.1	N28 04.6
Procyon	245 27.4	N 5 16.8
Rasalhague	96 31.7	N12 34.7
Regulus	208 11.8	N12 04.4
Rigel	281 37.5	S 8 13.7
Rigil Kent.	140 28.7	S60 44.3
Sabik	102 43.6	S15 41.8
Schedar	350 10.9	N56 25.3
Shaula	96 58.7	S37 05.2
Sirius	258 57.0	S16 41.3
Spica	158 59.6	S11 02.7
Suhail	223 11.8	S43 20.5
Vega	80 57.5	N38 45.9
Zuben'ubi	137 35.3	S15 56.9

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	98 06.5	11 27
Mars	225 33.1	2 56
Jupiter	268 40.9	0 04
Saturn	206 59.1	4 10

1977 DECEMBER 21, 22, 23 (WED., THURS., FRI.)

	G.M.T.	SUN G.H.A.	SUN Dec.	MOON G.H.A.	v	MOON Dec.	d	H.P.
	d h	° ′	° ′	° ′	′	° ′	′	′
	21 00	180 31.7	S23 26.1	51 27.5	13.5	N12 29.6	7.2	54.7
	01	195 31.4	26.2	66 00.0	13.4	12 36.8	7.1	54.7
	02	210 31.1	26.2	80 32.4	13.4	12 43.9	7.1	54.6
	03	225 30.8	· · 26.2	95 04.8	13.4	12 51.0	7.0	54.6
	04	240 30.5	26.2	109 37.2	13.4	12 58.0	6.9	54.6
	05	255 30.2	26.2	124 09.6	13.3	13 04.9	6.9	54.6
	06	270 29.9	S23 26.2	138 41.9	13.4	N13 11.8	6.8	54.6
W	07	285 29.5	26.3	153 14.3	13.3	13 18.6	6.8	54.6
E	08	300 29.2	26.3	167 46.6	13.3	13 25.4	6.6	54.5
D	09	315 28.9	· · 26.3	182 18.9	13.4	13 32.0	6.7	54.5
N	10	330 28.6	26.3	196 51.3	13.2	13 38.7	6.5	54.5
E	11	345 28.3	26.3	211 23.5	13.3	13 45.2	6.5	54.5
S	12	0 28.0	S23 26.3	225 55.8	13.3	N13 51.7	6.5	54.5
D	13	15 27.7	26.3	240 28.1	13.2	13 58.2	6.4	54.5
A	14	30 27.4	26.3	255 00.3	13.3	14 04.6	6.3	54.5
Y	15	45 27.1	· · 26.3	269 32.6	13.2	14 10.9	6.2	54.4
	16	60 26.8	26.3	284 04.8	13.2	14 17.1	6.2	54.4
	17	75 26.4	26.3	298 37.0	13.2	14 23.3	6.1	54.4
	18	90 26.1	S23 26.4	313 09.2	13.2	N14 29.4	6.1	54.4
	19	105 25.8	26.4	327 41.4	13.1	14 35.5	5.9	54.4
	20	120 25.5	26.4	342 13.5	13.2	14 41.4	5.9	54.4
	21	135 25.2	· · 26.4	356 45.7	13.1	14 47.3	5.9	54.4
	22	150 24.9	26.4	11 17.8	13.1	14 53.2	5.8	54.4
	23	165 24.6	26.4	25 49.9	13.1	14 59.0	5.7	54.3
	22 00	180 24.3	S23 26.4	40 22.0	13.1	N15 04.7	5.6	54.3
	01	195 24.0	26.4	54 54.1	13.0	15 10.3	5.6	54.3
	02	210 23.6	26.4	69 26.1	13.1	15 15.9	5.5	54.3
	03	225 23.3	· · 26.4	83 58.2	13.0	15 21.4	5.4	54.3
	04	240 23.0	26.4	98 30.2	13.0	15 26.8	5.4	54.3
	05	255 22.7	26.4	113 02.2	13.0	15 32.2	5.2	54.3
	06	270 22.4	S23 26.3	127 34.2	13.0	N15 37.4	5.3	54.3
	07	285 22.1	26.3	142 06.2	12.9	15 42.7	5.1	54.3
T	08	300 21.8	26.3	156 38.1	13.0	15 47.8	5.1	54.2
H	09	315 21.5	· · 26.3	171 10.1	12.9	15 52.9	5.0	54.2
U	10	330 21.2	26.3	185 42.0	12.9	15 57.9	4.9	54.2
R	11	345 20.9	26.3	200 13.9	12.9	16 02.8	4.9	54.2
S	12	0 20.5	S23 26.3	214 45.8	12.9	N16 07.7	4.7	54.2
D	13	15 20.2	26.3	229 17.7	12.8	16 12.4	4.7	54.2
A	14	30 19.9	26.3	243 49.5	12.9	16 17.1	4.7	54.2
Y	15	45 19.6	· · 26.3	258 21.4	12.8	16 21.8	4.5	54.2
	16	60 19.3	26.3	272 53.2	12.8	16 26.3	4.5	54.2
	17	75 19.0	26.2	287 25.0	12.8	16 30.8	4.4	54.2
	18	90 18.7	S23 26.2	301 56.8	12.8	N16 35.2	4.4	54.1
	19	105 18.4	26.2	316 28.6	12.7	16 39.6	4.2	54.1
	20	120 18.1	26.2	331 00.3	12.8	16 43.8	4.2	54.1
	21	135 17.8	· · 26.2	345 32.1	12.7	16 48.0	4.1	54.1
	22	150 17.4	26.2	0 03.8	12.7	16 52.1	4.0	54.1
	23	165 17.1	26.1	14 35.5	12.7	16 56.1	4.0	54.1
	23 00	180 16.8	S23 26.1	29 07.2	12.7	N17 00.1	3.8	54.1
	01	195 16.5	26.1	43 38.9	12.7	17 03.9	3.8	54.1
	02	210 16.2	26.1	58 10.6	12.6	17 07.7	3.8	54.1
	03	225 15.9	· · 26.1	72 42.2	12.6	17 11.5	3.6	54.1
	04	240 15.6	26.0	87 13.8	12.7	17 15.1	3.6	54.1
	05	255 15.3	26.0	101 45.5	12.6	17 18.7	3.4	54.1
	06	270 15.0	S23 26.0	116 17.1	12.6	N17 22.1	3.4	54.1
	07	285 14.6	26.0	130 48.7	12.5	17 25.5	3.4	54.1
	08	300 14.3	25.9	145 20.2	12.6	17 28.9	3.2	54.0
F	09	315 14.0	· · 25.9	159 51.8	12.6	17 32.1	3.2	54.0
R	10	330 13.7	25.9	174 23.4	12.5	17 35.3	3.1	54.0
I	11	345 13.4	25.9	188 54.9	12.5	17 38.4	3.0	54.0
D	12	0 13.1	S23 25.8	203 26.4	12.5	N17 41.4	2.9	54.0
A	13	15 12.8	25.8	217 57.9	12.5	17 44.3	2.8	54.0
Y	14	30 12.5	25.8	232 29.4	12.5	17 47.1	2.8	54.0
	15	45 12.2	· · 25.7	247 00.9	12.5	17 49.9	2.7	54.0
	16	60 11.9	25.7	261 32.4	12.5	17 52.6	2.6	54.0
	17	75 11.5	25.7	276 03.9	12.4	17 55.2	2.5	54.0
	18	90 11.2	S23 25.6	290 35.3	12.5	N17 57.7	2.4	54.0
	19	105 10.9	25.6	305 06.8	12.4	18 00.1	2.4	54.0
	20	120 10.6	25.6	319 38.2	12.4	18 02.5	2.2	54.0
	21	135 10.3	· · 25.5	334 09.6	12.4	18 04.7	2.2	54.0
	22	150 10.0	25.5	348 41.0	12.4	18 06.9	2.1	54.0
	23	165 09.7	25.4	3 12.4	12.4	18 09.0	2.0	54.0
		S.D. 16.3	*d* 0.0	S.D. 14.8		14.8		14.7

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 21	22	23	24
°	h m	h m	h m	h m	h m	h m	h m
N 72	08 26	10 58	■	11 41	11 32	11 17	□
N 70	08 06	09 55	■	12 07	12 12	12 24	12 49
68	07 50	09 20	■	12 27	12 40	13 00	13 33
66	07 37	08 54	10 35	12 43	13 01	13 26	14 02
64	07 26	08 34	09 53	12 56	13 18	13 46	14 24
62	07 16	08 18	09 24	13 08	13 32	14 03	14 42
60	07 08	08 05	09 03	13 17	13 44	14 16	14 57
N 58	07 00	07 53	08 45	13 26	13 54	14 28	15 09
56	06 53	07 43	08 30	13 33	14 03	14 38	15 20
54	06 47	07 34	08 17	13 40	14 11	14 47	15 30
52	06 42	07 25	08 06	13 45	14 18	14 55	15 38
50	06 36	07 18	07 56	13 51	14 24	15 02	15 46
45	06 24	07 02	07 36	14 03	14 38	15 18	16 02
N 40	06 14	06 48	07 19	14 12	14 50	15 31	16 15
35	06 05	06 36	07 05	14 21	15 00	15 42	16 27
30	05 56	06 26	06 52	14 28	15 08	15 51	16 37
20	05 39	06 07	06 31	14 41	15 23	16 08	16 54
N 10	05 23	05 49	06 12	14 52	15 36	16 22	17 09
0	05 06	05 32	05 55	15 02	15 48	16 35	17 23
S 10	04 47	05 14	05 37	15 13	16 01	16 49	17 37
20	04 24	04 54	05 18	15 24	16 14	17 03	17 52
30	03 55	04 29	04 56	15 37	16 29	17 20	18 09
35	03 37	04 13	04 43	15 45	16 38	17 30	18 19
40	03 13	03 55	04 28	15 53	16 48	17 41	18 30
45	02 43	03 32	04 10	16 03	17 00	17 54	18 44
S 50	01 57	03 03	03 47	16 16	17 14	18 10	19 00
52	01 29	02 48	03 36	16 21	17 21	18 17	19 08
54	00 42	02 29	03 24	16 28	17 28	18 25	19 17
56	////	02 07	03 10	16 35	17 37	18 35	19 26
58	////	01 37	02 53	16 43	17 46	18 45	19 37
S 60	////	00 46	02 32	16 52	17 57	18 57	19 50

Lat.	Sunset	Twilight Civil	Twilight Naut.	Moonset 21	22	23	24
°	h m	h m	h m	h m	h m	h m	h m
N 72	■	12 59	15 31	05 47	07 31	09 24	□
N 70	■	14 02	15 51	05 22	06 52	08 17	09 30
68	■	14 38	16 07	05 03	06 25	07 41	08 46
66	13 22	15 03	16 20	04 47	06 04	07 15	08 17
64	14 05	15 23	16 31	04 35	05 48	06 56	07 55
62	14 33	15 39	16 41	04 24	05 35	06 40	07 38
60	14 55	15 53	16 49	04 15	05 23	06 26	07 23
N 58	15 12	16 04	16 57	04 08	05 13	06 15	07 10
56	15 27	16 15	17 04	04 01	05 05	06 05	07 00
54	15 40	16 24	17 10	03 54	04 57	05 56	06 50
52	15 51	16 32	17 16	03 49	04 50	05 48	06 42
50	16 01	16 39	17 21	03 44	04 44	05 41	06 34
45	16 22	16 55	17 33	03 33	04 31	05 26	06 18
N 40	16 38	17 09	17 43	03 24	04 20	05 14	06 05
35	16 53	17 21	17 53	03 17	04 11	05 03	05 54
30	17 05	17 31	18 01	03 10	04 02	04 54	05 44
20	17 26	17 50	18 18	02 58	03 48	04 38	05 27
N 10	17 45	18 08	18 34	02 48	03 36	04 24	05 12
0	18 02	18 25	18 51	02 39	03 25	04 11	04 58
S 10	18 20	18 43	19 10	02 29	03 13	03 58	04 44
20	18 39	19 04	19 33	02 19	03 01	03 44	04 30
30	19 01	19 29	20 02	02 08	02 47	03 28	04 13
35	19 14	19 44	20 21	02 01	02 39	03 19	04 03
40	19 29	20 02	20 44	01 53	02 30	03 09	03 51
45	19 47	20 25	21 15	01 45	02 19	02 56	03 38
S 50	20 10	20 55	22 00	01 34	02 06	02 42	03 22
52	20 21	21 10	22 28	01 29	02 00	02 35	03 15
54	20 33	21 28	23 15	01 24	01 53	02 27	03 06
56	20 47	21 50	////	01 18	01 46	02 18	02 57
58	21 04	22 20	////	01 11	01 37	02 08	02 46
S 60	21 25	23 11	////	01 04	01 28	01 57	02 34

Day	SUN Eqn. of Time 00ʰ	SUN Eqn. of Time 12ʰ	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	Age	Phase
	m s	m s	h m	h m	h m	d	
21	02 07	01 53	11 58	21 13	08 50	11	
22	01 38	01 23	11 59	22 00	09 36	12	◐
23	01 08	00 53	11 59	22 47	10 23	13	

1977 DECEMBER 24, 25, 26 (SAT., SUN., MON.)

G.M.T.	ARIES	VENUS −3.4		MARS −0.7		JUPITER −2.3		SATURN +0.6	
	G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
d h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
24 00	92 24.4	187 47.0	S23 19.5	318 13.1	N20 56.8	1 23.0	N23 10.9	299 25.8	N12 37.9
01	107 26.9	202 46.0	19.7	333 15.9	57.0	16 25.9	10.9	314 28.3	37.9
02	122 29.3	217 45.1	19.9	348 18.7	57.2	31 28.7	10.9	329 30.8	37.9
03	137 31.8	232 44.1	·· 20.1	3 21.5	·· 57.4	46 31.5	·· 10.9	344 33.3	·· 37.9
04	152 34.3	247 43.2	20.3	18 24.4	57.6	61 34.4	10.9	359 35.8	38.0
05	167 36.7	262 42.2	20.5	33 27.2	57.9	76 37.2	11.0	14 38.4	38.0
06	182 39.2	277 41.3	S23 20.7	48 30.0	N20 58.1	91 40.0	N23 11.0	29 40.9	N12 38.0
07	197 41.7	292 40.3	21.0	63 32.9	58.3	106 42.9	11.0	44 43.4	38.1
S 08	212 44.1	307 39.4	21.2	78 35.7	58.5	121 45.7	11.0	59 45.9	38.1
A 09	227 46.6	322 38.4	·· 21.4	93 38.5	·· 58.7	136 48.5	·· 11.0	74 48.4	·· 38.1
T 10	242 49.0	337 37.4	21.6	108 41.4	58.9	151 51.4	11.0	89 50.9	38.1
U 11	257 51.5	352 36.5	21.8	123 44.2	59.1	166 54.2	11.0	104 53.5	38.2
R 12	272 54.0	7 35.5	S23 22.0	138 47.1	N20 59.4	181 57.0	N23 11.0	119 56.0	N12 38.2
D 13	287 56.4	22 34.6	22.2	153 49.9	59.6	196 59.9	11.0	134 58.5	38.2
A 14	302 58.9	37 33.6	22.4	168 52.7	20 59.8	212 02.7	11.0	150 01.0	38.3
Y 15	318 01.4	52 32.7	·· 22.6	183 55.6	21 00.0	227 05.5	·· 11.0	165 03.5	·· 38.3
16	333 03.8	67 31.7	22.8	198 58.4	00.2	242 08.4	11.0	180 06.1	38.3
17	348 06.3	82 30.7	23.0	214 01.3	00.4	257 11.2	11.1	195 08.6	38.4
18	3 08.8	97 29.8	S23 23.2	229 04.1	N21 00.7	272 14.0	N23 11.1	210 11.1	N12 38.4
19	18 11.2	112 28.8	23.4	244 07.0	00.9	287 16.9	11.1	225 13.6	38.4
20	33 13.7	127 27.9	23.6	259 09.8	01.1	302 19.7	11.1	240 16.1	38.4
21	48 16.1	142 26.9	·· 23.8	274 12.7	·· 01.3	317 22.5	·· 11.1	255 18.6	·· 38.5
22	63 18.6	157 25.9	24.0	289 15.6	01.5	332 25.4	11.1	270 21.2	38.5
23	78 21.1	172 25.0	24.1	304 18.4	01.7	347 28.2	11.1	285 23.7	38.5
25 00	93 23.5	187 24.0	S23 24.3	319 21.3	N21 02.0	2 31.0	N23 11.1	300 26.2	N12 38.6
01	108 26.0	202 23.1	24.5	334 24.1	02.2	17 33.9	11.1	315 28.7	38.6
02	123 28.5	217 22.1	24.7	349 27.0	02.4	32 36.7	11.1	330 31.2	38.6
03	138 30.9	232 21.2	·· 24.9	4 29.9	·· 02.6	47 39.5	·· 11.1	345 33.8	·· 38.7
04	153 33.4	247 20.2	25.1	19 32.7	02.8	62 42.4	11.1	0 36.3	38.7
05	168 35.9	262 19.2	25.3	34 35.6	03.1	77 45.2	11.2	15 38.8	38.7
06	183 38.3	277 18.3	S23 25.4	49 38.5	N21 03.3	92 48.0	N23 11.2	30 41.3	N12 38.8
07	198 40.8	292 17.3	25.6	64 41.3	03.5	107 50.9	11.2	45 43.9	38.8
08	213 43.3	307 16.4	25.8	79 44.2	03.7	122 53.7	11.2	60 46.4	38.8
S 09	228 45.7	322 15.4	·· 26.0	94 47.1	·· 04.0	137 56.5	·· 11.2	75 48.9	·· 38.9
U 10	243 48.2	337 14.4	26.2	109 50.0	04.2	152 59.4	11.2	90 51.4	38.9
N 11	258 50.6	352 13.5	26.3	124 52.8	04.4	168 02.2	11.2	105 53.9	38.9
D 12	273 53.1	7 12.5	S23 26.5	139 55.7	N21 04.6	183 05.0	N23 11.2	120 56.5	N12 38.9
A 13	288 55.6	22 11.5	26.7	154 58.6	04.8	198 07.9	11.2	135 59.0	39.0
Y 14	303 58.0	37 10.6	26.8	170 01.5	05.1	213 10.7	11.2	151 01.5	39.0
15	319 00.5	52 09.6	·· 27.0	185 04.4	·· 05.3	228 13.5	·· 11.2	166 04.0	·· 39.0
16	334 03.0	67 08.7	27.2	200 07.2	05.5	243 16.4	11.2	181 06.6	39.1
17	349 05.4	82 07.7	27.4	215 10.1	05.7	258 19.2	11.2	196 09.1	39.1
18	4 07.9	97 06.7	S23 27.5	230 13.0	N21 06.0	273 22.0	N23 11.3	211 11.6	N12 39.1
19	19 10.4	112 05.8	27.7	245 15.9	06.2	288 24.9	11.3	226 14.1	39.2
20	34 12.8	127 04.8	27.8	260 18.8	06.4	303 27.7	11.3	241 16.6	39.2
21	49 15.3	142 03.9	·· 28.0	275 21.7	·· 06.7	318 30.5	·· 11.3	256 19.2	·· 39.2
22	64 17.8	157 02.9	28.2	290 24.6	06.9	333 33.3	11.3	271 21.7	39.3
23	79 20.2	172 01.9	28.3	305 27.5	07.1	348 36.2	11.3	286 24.2	39.3
26 00	94 22.7	187 01.0	S23 28.5	320 30.4	N21 07.3	3 39.0	N23 11.3	301 26.7	N12 39.3
01	109 25.1	202 00.0	28.7	335 33.3	07.6	18 41.8	11.3	316 29.3	39.4
02	124 27.6	216 59.0	28.8	350 36.2	07.8	33 44.7	11.3	331 31.8	39.4
03	139 30.1	231 58.1	·· 29.0	5 39.1	·· 08.0	48 47.5	·· 11.3	346 34.3	·· 39.4
04	154 32.5	246 57.1	29.1	20 42.0	08.3	63 50.3	11.3	1 36.8	39.5
05	169 35.0	261 56.2	29.3	35 44.9	08.5	78 53.2	11.3	16 39.4	39.5
06	184 37.5	276 55.2	S23 29.4	50 47.8	N21 08.7	93 56.0	N23 11.3	31 41.9	N12 39.5
07	199 39.9	291 54.2	29.6	65 50.7	08.9	108 58.8	11.4	46 44.4	39.6
08	214 42.4	306 53.3	29.7	80 53.6	09.2	124 01.7	11.4	61 46.9	39.6
M 09	229 44.9	321 52.3	·· 29.9	95 56.5	·· 09.4	139 04.5	·· 11.4	76 49.5	·· 39.6
O 10	244 47.3	336 51.3	30.0	110 59.4	09.6	154 07.3	11.4	91 52.0	39.7
N 11	259 49.8	351 50.4	30.2	126 02.3	09.9	169 10.2	11.4	106 54.5	39.7
D 12	274 52.2	6 49.4	S23 30.3	141 05.2	N21 10.1	184 13.0	N23 11.4	121 57.1	N12 39.7
A 13	289 54.7	21 48.4	30.4	156 08.1	10.3	199 15.8	11.4	136 59.6	39.7
Y 14	304 57.2	36 47.5	30.6	171 11.1	10.6	214 18.7	11.4	152 02.1	39.8
15	319 59.6	51 46.5	·· 30.7	186 14.0	·· 10.8	229 21.5	·· 11.4	167 04.6	·· 39.8
16	335 02.1	66 45.5	30.9	201 16.9	11.0	244 24.3	11.4	182 07.2	39.8
17	350 04.6	81 44.6	31.0	216 19.8	11.3	259 27.2	11.4	197 09.7	39.9
18	5 07.0	96 43.6	S23 31.1	231 22.7	N21 11.5	274 30.0	N23 11.4	212 12.2	N12 39.9
19	20 09.5	111 42.7	31.3	246 25.7	11.7	289 32.8	11.4	227 14.7	39.9
20	35 12.0	126 41.7	31.4	261 28.6	12.0	304 35.6	11.5	242 17.3	40.0
21	50 14.4	141 40.7	·· 31.5	276 31.5	·· 12.2	319 38.5	·· 11.5	257 19.8	·· 40.0
22	65 16.9	156 39.8	31.7	291 34.4	12.4	334 41.3	11.5	272 22.3	40.0
23	80 19.4	171 38.8	31.8	306 37.4	12.7	349 44.1	11.5	287 24.9	40.1
	h m								
Mer. Pass.	17 43.5	v −1.0	d 0.2	v 2.9	d 0.2	v 2.8	d 0.0	v 2.5	d 0.0

STARS

Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 38.4	S40 23.8
Achernar	335 46.5	S57 21.2
Acrux	173 39.2	S62 58.3
Adhara	255 33.2	S28 56.6
Aldebaran	291 19.8	N16 27.9
Alioth	166 44.3	N56 04.5
Alkaid	153 20.2	N49 25.2
Al Na'ir	28 17.6	S47 04.2
Alnilam	276 13.2	S 1 13.1
Alphard	218 22.1	S 8 33.8
Alphecca	126 34.0	N26 47.3
Alpheratz	358 11.2	N28 58.3
Altair	62 34.6	N 8 48.7
Ankaa	353 42.1	S42 25.8
Antares	112 59.4	S26 22.9
Arcturus	146 20.3	N19 17.8
Atria	108 25.8	S68 59.1
Avior	234 28.3	S59 26.3
Bellatrix	279 00.4	N 6 19.7
Betelgeuse	271 29.9	N 7 24.1
Canopus	264 07.4	S52 41.1
Capella	281 13.5	N45 58.5
Deneb	49 50.1	N45 12.3
Denebola	183 00.9	N14 41.6
Diphda	349 22.7	S18 06.6
Dubhe	194 24.3	N61 51.8
Elnath	278 46.1	N28 35.3
Eltanin	90 59.1	N51 29.6
Enif	34 13.6	N 9 46.6
Fomalhaut	15 53.6	S29 44.5
Gacrux	172 30.7	S56 59.1
Gienah	176 19.8	S17 25.1
Hadar	149 26.1	S60 15.7
Hamal	328 30.8	N23 21.6
Kaus Aust.	84 19.7	S34 23.6
Kochab	137 19.9	N74 14.6
Markab	14 05.1	N15 05.3
Menkar	314 42.8	N 4 00.2
Menkent	148 39.3	S36 15.5
Miaplacidus	221 44.5	S69 37.5
Mirfak	309 18.3	N49 47.1
Nunki	76 31.8	S26 19.4
Peacock	54 01.9	S56 48.4
Pollux	244 00.1	N28 04.6
Procyon	245 27.4	N 5 16.8
Rasalhague	96 31.6	N12 34.6
Regulus	208 11.8	N12 04.4
Rigel	281 37.4	S 8 13.7
Rigil Kent.	140 28.6	S60 44.3
Sabik	102 43.6	S15 41.8
Schedar	350 10.9	N56 25.3
Shaula	96 58.7	S37 05.2
Sirius	258 57.0	S16 41.3
Spica	158 59.6	S11 02.7
Suhail	223 11.7	S43 20.6
Vega	80 57.5	N38 45.9
Zuben'ubi	137 35.3	S15 56.9

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	94 00.5	11 31
Mars	225 57.7	2 42
Jupiter	269 07.5	23 45
Saturn	207 02.7	3 58

G.M.T.		SUN		MOON				
		G.H.A.	Dec.	G.H.A.	v	Dec.	d	H.P.
d h		° ′	° ′	° ′	′	° ′	′	′
24 00		180 09.4	S23 25.4	17 43.8	12.4	N18 11.0	2.0	54.0
01		195 09.1	25.4	32 15.2	12.3	18 13.0	1.8	54.0
02		210 08.8	25.3	46 46.5	12.4	18 14.8	1.8	54.0
03		225 08.4	·· 25.3	61 17.9	12.4	18 16.6	1.7	54.0
04		240 08.1	25.2	75 49.3	12.3	18 18.3	1.6	54.0
05		255 07.8	25.2	90 20.6	12.3	18 19.9	1.5	54.0
06		270 07.5	S23 25.2	104 51.9	12.4	N18 21.4	1.5	54.0
07		285 07.2	25.1	119 23.3	12.3	18 22.9	1.3	54.0
08	S	300 06.9	25.1	133 54.6	12.3	18 24.2	1.3	54.0
09	A	315 06.6	·· 25.0	148 25.9	12.3	18 25.5	1.2	54.0
10	T	330 06.3	25.0	162 57.2	12.3	18 26.7	1.1	54.0
11	U	345 06.0	24.9	177 28.5	12.3	18 27.8	1.0	53.9
12	R	0 05.7	S23 24.9	191 59.8	12.3	N18 28.8	0.9	53.9
13	D	15 05.3	24.8	206 31.1	12.3	18 29.7	0.9	53.9
14	A	30 05.0	24.8	221 02.4	12.3	18 30.6	0.7	53.9
15	Y	45 04.7	·· 24.7	235 33.7	12.2	18 31.3	0.7	53.9
16		60 04.4	24.7	250 04.9	12.3	18 32.0	0.6	53.9
17		75 04.1	24.6	264 36.2	12.3	18 32.6	0.5	53.9
18		90 03.8	S23 24.6	279 07.5	12.2	N18 33.1	0.4	53.9
19		105 03.5	24.5	293 38.7	12.3	18 33.5	0.4	53.9
20		120 03.2	24.4	308 10.0	12.3	18 33.9	0.2	53.9
21		135 02.9	·· 24.4	322 41.3	12.2	18 34.1	0.2	53.9
22		150 02.6	24.3	337 12.5	12.3	18 34.3	0.1	53.9
23		165 02.2	24.3	351 43.8	12.2	18 34.4	0.0	53.9
25 00		180 01.9	S23 24.2	6 15.0	12.3	N18 34.4	0.1	53.9
01		195 01.6	24.2	20 46.3	12.2	18 34.3	0.2	53.9
02		210 01.3	24.1	35 17.5	12.3	18 34.1	0.2	53.9
03		225 01.0	·· 24.0	49 48.8	12.3	18 33.9	0.4	53.9
04		240 00.7	24.0	64 20.1	12.2	18 33.5	0.4	53.9
05		255 00.4	23.9	78 51.3	12.3	18 33.1	0.5	53.9
06		270 00.1	S23 23.8	93 22.6	12.2	N18 32.6	0.6	53.9
07		284 59.8	23.8	107 53.8	12.3	18 32.0	0.7	53.9
08		299 59.5	23.7	122 25.1	12.3	18 31.3	0.8	53.9
09	S	314 59.2	·· 23.7	136 56.4	12.2	18 30.5	0.8	54.0
10	U	329 58.8	23.6	151 27.6	12.3	18 29.7	1.0	54.0
11	N	344 58.5	23.5	165 58.9	12.3	18 28.7	1.0	54.0
12	D	359 58.2	S23 23.4	180 30.2	12.2	N18 27.7	1.1	54.0
13	A	14 57.9	23.4	195 01.4	12.3	18 26.6	1.2	54.0
14	Y	29 57.6	23.3	209 32.7	12.3	18 25.4	1.2	54.0
15		44 57.3	·· 23.2	224 04.0	12.3	18 24.2	1.4	54.0
16		59 57.0	23.2	238 35.3	12.3	18 22.8	1.5	54.0
17		74 56.7	23.1	253 06.6	12.3	18 21.3	1.5	54.0
18		89 56.4	S23 23.0	267 37.9	12.3	N18 19.8	1.6	54.0
19		104 56.1	22.9	282 09.2	12.3	18 18.2	1.7	54.0
20		119 55.8	22.9	296 40.5	12.3	18 16.5	1.8	54.0
21		134 55.4	·· 22.8	311 11.8	12.4	18 14.7	1.8	54.0
22		149 55.1	22.7	325 43.2	12.3	18 12.9	2.0	54.0
23		164 54.8	22.6	340 14.5	12.3	18 10.9	2.0	54.0
26 00		179 54.5	S23 22.6	354 45.8	12.4	N18 08.9	2.1	54.0
01		194 54.2	22.5	9 17.2	12.3	18 06.8	2.2	54.0
02		209 53.9	22.4	23 48.5	12.4	18 04.6	2.3	54.0
03		224 53.6	·· 22.3	38 19.9	12.4	18 02.3	2.3	54.0
04		239 53.3	22.2	52 51.3	12.4	18 00.0	2.5	54.0
05		254 53.0	22.2	67 22.7	12.4	17 57.5	2.5	54.0
06		269 52.7	S23 22.1	81 54.1	12.4	N17 55.0	2.6	54.0
07		284 52.4	22.0	96 25.5	12.4	17 52.4	2.7	54.0
08		299 52.1	21.9	110 56.9	12.4	17 49.7	2.8	54.0
09	M	314 51.7	·· 21.8	125 28.3	12.5	17 46.9	2.8	54.0
10	O	329 51.4	21.7	139 59.8	12.4	17 44.1	3.0	54.0
11	N	344 51.1	21.6	154 31.2	12.5	17 41.1	3.0	54.0
12	D	359 50.8	S23 21.6	169 02.7	12.5	N17 38.1	3.1	54.1
13	A	14 50.5	21.5	183 34.2	12.5	17 35.0	3.2	54.1
14	Y	29 50.2	21.4	198 05.7	12.5	17 31.8	3.2	54.1
15		44 49.9	·· 21.3	212 37.2	12.5	17 28.6	3.4	54.1
16		59 49.6	21.2	227 08.7	12.5	17 25.2	3.4	54.1
17		74 49.3	21.1	241 40.2	12.5	17 21.8	3.5	54.1
18		89 49.0	S23 21.0	256 11.7	12.6	N17 18.3	3.5	54.1
19		104 48.7	20.9	270 43.3	12.6	17 14.8	3.7	54.1
20		119 48.4	20.8	285 14.9	12.5	17 11.1	3.7	54.1
21		134 48.1	·· 20.7	299 46.4	12.6	17 07.4	3.8	54.1
22		149 47.7	20.6	314 18.0	12.6	17 03.6	3.9	54.1
23		164 47.4	20.5	328 49.6	12.7	16 59.7	4.0	54.1
		S.D. 16.3	d 0.1	S.D.	14.7	14.7		14.7

Lat.	Twilight		Sunrise	Moonrise			
	Naut.	Civil		24	25	26	27
°	h m	h m	h m	h m	h m	h m	h m
N 72	08 27	10 57	■	□	□	13 46	15 38
N 70	08 07	09 55	■	12 49	13 39	14 52	16 17
68	07 51	09 20	■	13 33	14 22	15 28	16 44
66	07 38	08 55	10 35	14 02	14 51	15 53	17 05
64	07 27	08 35	09 53	14 24	15 13	16 13	17 21
62	07 17	08 19	09 25	14 42	15 31	16 29	17 34
60	07 09	08 06	09 03	14 57	15 45	16 42	17 46
N 58	07 01	07 54	08 46	15 09	15 58	16 54	17 55
56	06 55	07 44	08 31	15 20	16 09	17 04	18 04
54	06 49	07 35	08 19	15 30	16 18	17 13	18 12
52	06 43	07 27	08 08	15 38	16 27	17 20	18 19
50	06 38	07 19	07 58	15 46	16 34	17 27	18 25
45	06 26	07 03	07 37	16 02	16 50	17 43	18 38
N 40	06 15	06 50	07 20	16 15	17 04	17 55	18 49
35	06 06	06 38	07 06	16 27	17 15	18 05	18 58
30	05 57	06 27	06 54	16 37	17 25	18 15	19 06
20	05 41	06 08	06 32	16 54	17 42	18 31	19 20
N 10	05 25	05 51	06 14	17 09	17 56	18 44	19 33
0	05 08	05 34	05 56	17 23	18 10	18 57	19 44
S 10	04 49	05 16	05 39	17 37	18 24	19 10	19 56
20	04 26	04 55	05 20	17 52	18 39	19 24	20 08
30	03 57	04 30	04 58	18 09	18 56	19 40	20 22
35	03 38	04 15	04 45	18 19	19 06	19 49	20 30
40	03 15	03 57	04 30	18 30	19 17	20 00	20 39
45	02 44	03 34	04 12	18 44	19 30	20 12	20 50
S 50	01 59	03 04	03 49	19 00	19 46	20 27	21 03
52	01 31	02 49	03 38	19 08	19 54	20 34	21 09
54	00 44	02 31	03 26	19 17	20 02	20 42	21 15
56	////	02 09	03 12	19 26	20 12	20 50	21 23
58	////	01 39	02 55	19 37	20 22	21 00	21 31
S 60	////	00 49	02 34	19 50	20 35	21 11	21 40

Lat.	Sunset	Twilight		Moonset			
		Civil	Naut.	24	25	26	27
°	h m	h m	h m	h m	h m	h m	h m
N 72	■	13 03	15 33	□	□	11 51	11 36
N 70	■	14 05	15 53	09 30	10 19	10 44	10 56
68	■	14 40	16 09	08 46	09 35	10 08	10 28
66	13 25	15 05	16 22	08 17	09 06	09 42	10 07
64	14 07	15 25	16 33	07 55	08 44	09 22	09 50
62	14 35	15 41	16 43	07 38	08 26	09 06	09 37
60	14 57	15 55	16 51	07 23	08 12	08 52	09 25
N 58	15 14	16 06	16 59	07 10	07 59	08 40	09 14
56	15 29	16 16	17 06	07 00	07 48	08 30	09 06
54	15 42	16 26	17 12	06 50	07 39	08 21	08 58
52	15 53	16 34	17 17	06 42	07 30	08 13	08 50
50	16 03	16 41	17 23	06 34	07 23	08 06	08 44
45	16 23	16 57	17 34	06 18	07 06	07 50	08 30
N 40	16 40	17 11	17 45	06 05	06 53	07 38	08 19
35	16 54	17 23	17 54	05 54	06 42	07 27	08 09
30	17 07	17 33	18 03	05 44	06 32	07 17	08 00
20	17 28	17 52	18 19	05 27	06 15	07 01	07 45
N 10	17 46	18 09	18 36	05 12	06 00	06 47	07 32
0	18 04	18 26	18 53	04 58	05 46	06 33	07 20
S 10	18 21	18 44	19 12	04 44	05 32	06 20	07 08
20	18 40	19 05	19 34	04 30	05 17	06 05	06 55
30	19 02	19 30	20 03	04 13	04 59	05 49	06 39
35	19 15	19 45	20 22	04 03	04 49	05 39	06 31
40	19 30	20 03	20 45	03 51	04 38	05 28	06 21
45	19 48	20 26	21 16	03 38	04 24	05 15	06 09
S 50	20 11	20 56	22 01	03 22	04 08	04 59	05 54
52	20 22	21 11	22 29	03 15	04 00	04 51	05 48
54	20 34	21 29	23 15	03 06	03 52	04 43	05 40
56	20 48	21 51	////	02 57	03 42	04 34	05 32
58	21 05	22 21	////	02 46	03 31	04 23	05 22
S 60	21 26	23 11	////	02 34	03 18	04 11	05 11

Day	SUN			MOON			
	Eqn. of Time 00h	Eqn. of Time 12h	Mer. Pass.	Mer. Pass. Upper	Mer. Pass. Lower	Age	Phase
	m s	m s	h m	h m	h m	d	
24	00 38	00 23	12 00	23 34	11 10	14	
25	00 08	00 06	12 00	24 22	11 58	15	○
26	00 21	00 36	12 01	00 22	12 45	16	

1977 DECEMBER 27, 28, 29 (TUES., WED., THURS.)

G.M.T.		ARIES	VENUS −3.4		MARS −0.7		JUPITER −2.3		SATURN +0.6	
		G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
d	h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
27	00	95 21.8	186 37.8	S23 31.9	321 40.3	N21 12.9	4 47.0	N23 11.5	302 27.4	N12 40.1
	01	110 24.3	201 36.9	32.1	336 43.2	13.1	19 49.8	11.5	317 29.9	40.2
	02	125 26.7	216 35.9	32.2	351 46.2	13.4	34 52.6	11.5	332 32.4	40.2
	03	140 29.2	231 34.9	·· 32.3	6 49.1	·· 13.6	49 55.5	·· 11.5	347 35.0	·· 40.2
	04	155 31.7	246 34.0	32.4	21 52.0	13.8	64 58.3	11.5	2 37.5	40.3
	05	170 34.1	261 33.0	32.6	36 55.0	14.1	80 01.1	11.5	17 40.0	40.3
	06	185 36.6	276 32.0	S23 32.7	51 57.9	N21 14.3	95 04.0	N23 11.5	32 42.6	N12 40.3
	07	200 39.1	291 31.1	32.8	67 00.9	14.6	110 06.8	11.5	47 45.1	40.4
TUESDAY	08	215 41.5	306 30.1	32.9	82 03.8	14.8	125 09.6	11.5	62 47.6	40.4
	09	230 44.0	321 29.1	·· 33.0	97 06.7	·· 15.0	140 12.5	·· 11.6	77 50.2	·· 40.4
	10	245 46.5	336 28.2	33.1	112 09.7	15.3	155 15.3	11.6	92 52.7	40.5
	11	260 48.9	351 27.2	33.3	127 12.6	15.5	170 18.1	11.6	107 55.2	40.5
	12	275 51.4	6 26.2	S23 33.4	142 15.6	N21 15.8	185 20.9	N23 11.6	122 57.7	N12 40.5
	13	290 53.9	21 25.3	33.5	157 18.5	16.0	200 23.8	11.6	138 00.3	40.6
	14	305 56.3	36 24.3	33.6	172 21.5	16.2	215 26.6	11.6	153 02.8	40.6
	15	320 58.8	51 23.3	·· 33.7	187 24.4	·· 16.5	230 29.4	·· 11.6	168 05.3	·· 40.6
	16	336 01.2	66 22.4	33.8	202 27.4	16.7	245 32.3	11.6	183 07.9	40.7
	17	351 03.7	81 21.4	33.9	217 30.4	17.0	260 35.1	11.6	198 10.4	40.7
	18	6 06.2	96 20.4	S23 34.0	232 33.3	N21 17.2	275 37.9	N23 11.6	213 12.9	N12 40.7
	19	21 08.6	111 19.5	34.1	247 36.3	17.4	290 40.8	11.6	228 15.5	40.8
	20	36 11.1	126 18.5	34.2	262 39.2	17.7	305 43.6	11.6	243 18.0	40.8
	21	51 13.6	141 17.5	·· 34.3	277 42.2	·· 17.9	320 46.4	·· 11.6	258 20.5	·· 40.8
	22	66 16.0	156 16.6	34.4	292 45.2	18.2	335 49.2	11.6	273 23.1	40.9
	23	81 18.5	171 15.6	34.5	307 48.1	18.4	350 52.1	11.7	288 25.6	40.9
28	00	96 21.0	186 14.6	S23 34.6	322 51.1	N21 18.6	5 54.9	N23 11.7	303 28.1	N12 40.9
	01	111 23.4	201 13.7	34.7	337 54.1	18.9	20 57.7	11.7	318 30.7	41.0
	02	126 25.9	216 12.7	34.8	352 57.0	19.1	36 00.6	11.7	333 33.2	41.0
	03	141 28.3	231 11.7	·· 34.9	8 00.0	·· 19.4	51 03.4	·· 11.7	348 35.7	·· 41.0
	04	156 30.8	246 10.7	35.0	23 03.0	19.6	66 06.2	11.7	3 38.3	41.1
	05	171 33.3	261 09.8	35.1	38 05.9	19.9	81 09.1	11.7	18 40.8	41.1
	06	186 35.7	276 08.8	S23 35.2	53 08.9	N21 20.1	96 11.9	N23 11.7	33 43.3	N12 41.2
WEDNESDAY	07	201 38.2	291 07.8	35.3	68 11.9	20.4	111 14.7	11.7	48 45.9	41.2
	08	216 40.7	306 06.9	35.4	83 14.9	20.6	126 17.5	11.7	63 48.4	41.2
	09	231 43.1	321 05.9	·· 35.5	98 17.9	·· 20.8	141 20.4	·· 11.7	78 50.9	·· 41.3
	10	246 45.6	336 04.9	35.6	113 20.8	21.1	156 23.2	11.7	93 53.5	41.3
	11	261 48.1	351 04.0	35.6	128 23.8	21.3	171 26.0	11.7	108 56.0	41.3
	12	276 50.5	6 03.0	S23 35.7	143 26.8	N21 21.6	186 28.9	N23 11.7	123 58.5	N12 41.4
	13	291 53.0	21 02.0	35.8	158 29.8	21.8	201 31.7	11.8	139 01.1	41.4
	14	306 55.5	36 01.1	35.9	173 32.8	22.1	216 34.5	11.8	154 03.6	41.4
	15	321 57.9	51 00.1	·· 36.0	188 35.8	·· 22.3	231 37.3	·· 11.8	169 06.1	·· 41.5
	16	337 00.4	65 59.1	36.0	203 38.8	22.6	246 40.2	11.8	184 08.7	41.5
	17	352 02.8	80 58.2	36.1	218 41.7	22.8	261 43.0	11.8	199 11.2	41.6
	18	7 05.3	95 57.2	S23 36.2	233 44.7	N21 23.1	276 45.8	N23 11.8	214 13.8	N12 41.6
	19	22 07.8	110 56.2	36.3	248 47.7	23.3	291 48.7	11.8	229 16.3	41.6
	20	37 10.2	125 55.2	36.3	263 50.7	23.6	306 51.5	11.8	244 18.8	41.7
	21	52 12.7	140 54.3	·· 36.4	278 53.7	·· 23.8	321 54.3	·· 11.8	259 21.4	·· 41.7
	22	67 15.2	155 53.3	36.5	293 56.7	24.1	336 57.1	11.8	274 23.9	41.7
	23	82 17.6	170 52.3	36.5	308 59.7	24.3	352 00.0	11.8	289 26.4	41.8
29	00	97 20.1	185 51.4	S23 36.6	324 02.7	N21 24.6	7 02.8	N23 11.8	304 29.0	N12 41.8
	01	112 22.6	200 50.4	36.7	339 05.7	24.8	22 05.6	11.8	319 31.5	41.8
	02	127 25.0	215 49.4	36.7	354 08.7	25.1	37 08.5	11.8	334 34.0	41.9
	03	142 27.5	230 48.5	·· 36.8	9 11.7	·· 25.3	52 11.3	·· 11.9	349 36.6	·· 41.9
	04	157 30.0	245 47.5	36.9	24 14.7	25.6	67 14.1	11.9	4 39.1	42.0
	05	172 32.4	260 46.5	36.9	39 17.8	25.8	82 16.9	11.9	19 41.7	42.0
	06	187 34.9	275 45.5	S23 37.0	54 20.8	N21 26.1	97 19.8	N23 11.9	34 44.2	N12 42.0
	07	202 37.3	290 44.6	37.1	69 23.8	26.3	112 22.6	11.9	49 46.7	42.1
THURSDAY	08	217 39.8	305 43.6	37.1	84 26.8	26.6	127 25.4	11.9	64 49.3	42.1
	09	232 42.3	320 42.6	·· 37.2	99 29.8	·· 26.8	142 28.3	·· 11.9	79 51.8	·· 42.1
	10	247 44.7	335 41.7	37.2	114 32.8	27.1	157 31.1	11.9	94 54.4	42.2
	11	262 47.2	350 40.7	37.3	129 35.8	27.3	172 33.9	11.9	109 56.9	42.2
	12	277 49.7	5 39.7	S23 37.3	144 38.9	N21 27.6	187 36.7	N23 11.9	124 59.4	N12 42.3
	13	292 52.1	20 38.8	37.4	159 41.9	27.8	202 39.6	11.9	140 02.0	42.3
	14	307 54.6	35 37.8	37.4	174 44.9	28.1	217 42.4	11.9	155 04.5	42.3
	15	322 57.1	50 36.8	·· 37.5	189 47.9	·· 28.4	232 45.2	·· 11.9	170 07.0	·· 42.4
	16	337 59.5	65 35.8	37.5	204 51.0	28.6	247 48.0	11.9	185 09.6	42.4
	17	353 02.0	80 34.9	37.6	219 54.0	28.9	262 50.9	11.9	200 12.1	42.4
	18	8 04.5	95 33.9	S23 37.6	234 57.0	N21 29.1	277 53.7	N23 12.0	215 14.7	N12 42.5
	19	23 06.9	110 32.9	37.7	250 00.0	29.4	292 56.5	12.0	230 17.2	42.5
	20	38 09.4	125 32.0	37.7	265 03.1	29.6	307 59.4	12.0	245 19.8	42.6
	21	53 11.8	140 31.0	·· 37.7	280 06.1	·· 29.9	323 02.2	·· 12.0	260 22.3	·· 42.6
	22	68 14.3	155 30.0	37.8	295 09.1	30.1	338 05.0	12.0	275 24.8	42.6
	23	83 16.8	170 29.0	37.8	310 12.2	30.4	353 07.8	12.0	290 27.4	42.7
Mer. Pass.		h m 17 31.7	v −1.0	d 0.1	v 3.0	d 0.2	v 2.8	d 0.0	v 2.5	d 0.0

STARS

Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 38.4	S40 23.8
Achernar	335 46.5	S57 21.2
Acrux	173 39.1	S62 58.3
Adhara	255 33.1	S28 56.6
Aldebaran	291 19.8	N16 27.9
Alioth	166 44.3	N56 04.5
Alkaid	153 20.2	N49 25.2
Al Na'ir	28 17.6	S47 04.2
Alnilam	276 13.2	S 1 13.1
Alphard	218 22.1	S 8 33.9
Alphecca	126 34.0	N26 47.3
Alpheratz	358 11.2	N28 58.3
Altair	62 34.6	N 8 48.7
Ankaa	353 42.1	S42 25.8
Antares	112 59.4	S26 22.9
Arcturus	146 20.3	N19 17.7
Atria	108 25.8	S68 59.1
Avior	234 28.3	S59 26.3
Bellatrix	279 00.4	N 6 19.7
Betelgeuse	271 29.9	N 7 24.1
Canopus	264 07.4	S52 41.2
Capella	281 13.5	N45 58.5
Deneb	49 50.1	N45 12.3
Denebola	183 00.9	N14 41.6
Diphda	349 22.7	S18 06.6
Dubhe	194 24.3	N61 51.8
Elnath	278 46.1	N28 35.3
Eltanin	90 59.1	N51 29.6
Enif	34 13.6	N 9 46.6
Fomalhaut	15 53.6	S29 44.5
Gacrux	172 30.7	S56 59.1
Gienah	176 19.8	S17 25.1
Hadar	149 26.1	S60 15.7
Hamal	328 30.8	N23 21.6
Kaus Aust.	84 19.7	S34 23.6
Kochab	137 19.9	N74 14.6
Markab	14 05.1	N15 05.3
Menkar	314 42.8	N 4 00.2
Menkent	148 39.3	S36 15.5
Miaplacidus	221 44.4	S69 37.5
Mirfak	309 18.3	N49 47.1
Nunki	76 31.8	S26 19.4
Peacock	54 01.9	S56 48.4
Pollux	244 00.1	N28 04.6
Procyon	245 27.4	N 5 16.8
Rasalhague	96 31.6	N12 34.6
Regulus	208 11.8	N12 04.3
Rigel	281 37.4	S 8 13.8
Rigil Kent.	140 28.6	S60 44.3
Sabik	102 43.6	S15 41.8
Schedar	350 10.9	N56 25.3
Shaula	96 58.7	S37 05.2
Sirius	258 57.0	S16 41.3
Spica	158 59.5	S11 02.7
Suhail	223 11.7	S43 20.6
Vega	80 57.5	N38 45.9
Zuben'ubi	137 35.3	S15 56.9

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	89 53.7	11 36
Mars	226 30.1	2 28
Jupiter	269 33.9	23 32
Saturn	207 07.2	3 45

G.M.T.			SUN			MOON					
			G.H.A.	Dec.		G.H.A.	v	Dec.		d	H.P.
d	h		° ′	°	′	° ′	′	°	′	′	′
27	00		179 47.1	S23	20.4	343 21.3	12.6	N16	55.7	4.0	54.1
	01		194 46.8		20.3	357 52.9	12.7	16	51.7	4.2	54.1
	02		209 46.5		20.2	12 24.6	12.6	16	47.5	4.2	54.1
	03		224 46.2	··	20.1	26 56.2	12.7	16	43.3	4.2	54.2
	04		239 45.9		20.0	41 27.9	12.7	16	39.1	4.4	54.2
	05		254 45.6		19.9	55 59.6	12.7	16	34.7	4.4	54.2
	06		269 45.3	S23	19.8	70 31.3	12.8	N16	30.3	4.5	54.2
	07		284 45.0		19.7	85 03.1	12.7	16	25.8	4.6	54.2
	08	T	299 44.7		19.6	99 34.8	12.8	16	21.2	4.6	54.2
	09	U	314 44.4	··	19.5	114 06.6	12.8	16	16.6	4.8	54.2
	10	E	329 44.1		19.4	128 38.4	12.7	16	11.8	4.8	54.2
	11	S	344 43.8		19.3	143 10.1	12.9	16	07.0	4.8	54.2
	12	D	359 43.5	S23	19.2	157 42.0	12.8	N16	02.2	5.0	54.2
	13	A	14 43.1		19.1	172 13.8	12.8	15	57.2	5.0	54.2
	14	Y	29 42.8		19.0	186 45.6	12.9	15	52.2	5.1	54.2
	15		44 42.5	··	18.9	201 17.5	12.9	15	47.1	5.2	54.3
	16		59 42.2		18.8	215 49.4	12.9	15	41.9	5.2	54.3
	17		74 41.9		18.6	230 21.3	12.9	15	36.7	5.3	54.3
	18		89 41.6	S23	18.5	244 53.2	12.9	N15	31.4	5.4	54.3
	19		104 41.3		18.4	259 25.1	13.0	15	26.0	5.5	54.3
	20		119 41.0		18.3	273 57.1	12.9	15	20.5	5.5	54.3
	21		134 40.7	··	18.2	288 29.0	13.0	15	15.0	5.6	54.3
	22		149 40.4		18.1	303 01.0	13.0	15	09.4	5.6	54.3
	23		164 40.1		18.0	317 33.0	13.0	15	03.8	5.8	54.3
28	00		179 39.8	S23	17.8	332 05.0	13.0	N14	58.0	5.8	54.4
	01		194 39.5		17.7	346 37.0	13.1	14	52.2	5.8	54.4
	02		209 39.2		17.6	1 09.1	13.1	14	46.4	6.0	54.4
	03		224 38.9	··	17.5	15 41.2	13.0	14	40.4	6.0	54.4
	04		239 38.6		17.4	30 13.2	13.1	14	34.4	6.1	54.4
	05		254 38.3		17.2	44 45.3	13.2	14	28.3	6.1	54.4
	06		269 37.9	S23	17.1	59 17.5	13.1	N14	22.2	6.2	54.4
	07	W	284 37.6		17.0	73 49.6	13.1	14	16.0	6.3	54.4
	08	E	299 37.3		16.9	88 21.7	13.2	14	09.7	6.3	54.4
	09	D	314 37.0	··	16.7	102 53.9	13.2	14	03.4	6.4	54.5
	10	N	329 36.7		16.6	117 26.1	13.2	13	57.0	6.5	54.5
	11	E	344 36.4		16.5	131 58.3	13.2	13	50.5	6.5	54.5
	12	S	359 36.1	S23	16.4	146 30.5	13.2	N13	44.0	6.6	54.5
	13	D	14 35.8		16.2	161 02.7	13.3	13	37.4	6.6	54.5
	14	A	29 35.5		16.1	175 35.0	13.2	13	30.8	6.8	54.5
	15	Y	44 35.2	··	16.0	190 07.2	13.3	13	24.0	6.7	54.5
	16		59 34.9		15.8	204 39.5	13.3	13	17.3	6.9	54.6
	17		74 34.6		15.7	219 11.8	13.3	13	10.4	6.9	54.6
	18		89 34.3	S23	15.6	233 44.1	13.3	N13	03.5	7.0	54.6
	19		104 34.0		15.4	248 16.4	13.4	12	56.5	7.0	54.6
	20		119 33.7		15.3	262 48.8	13.3	12	49.5	7.1	54.6
	21		134 33.4	···	15.2	277 21.1	13.4	12	42.4	7.1	54.6
	22		149 33.1		15.0	291 53.5	13.3	12	35.3	7.2	54.6
	23		164 32.8		14.9	306 25.8	13.4	12	28.1	7.3	54.7
29	00		179 32.5	S23	14.8	320 58.2	13.4	N12	20.8	7.3	54.7
	01		194 32.2		14.6	335 30.6	13.5	12	13.5	7.4	54.7
	02		209 31.9		14.5	350 03.1	13.4	12	06.1	7.4	54.7
	03		224 31.6	··	14.4	4 35.5	13.4	11	58.7	7.5	54.7
	04		239 31.3		14.2	19 07.9	13.5	11	51.2	7.5	54.7
	05		254 30.9		14.1	33 40.4	13.5	11	43.7	7.6	54.7
	06		269 30.6	S23	13.9	48 12.9	13.5	N11	36.1	7.7	54.8
	07		284 30.3		13.8	62 45.4	13.5	11	28.4	7.7	54.8
	08	T	299 30.0		13.6	77 17.9	13.5	11	20.7	7.8	54.8
	09	H	314 29.7	··	13.5	91 50.4	13.5	11	12.9	7.8	54.8
	10	U	329 29.4		13.4	106 22.9	13.5	11	05.1	7.9	54.8
	11	R	344 29.1		13.2	120 55.4	13.5	10	57.2	7.9	54.9
	12	S	359 28.8	S23	13.1	135 27.9	13.6	N10	49.3	8.0	54.9
	13	D	14 28.5		12.9	150 00.5	13.5	10	41.3	8.0	54.9
	14	A	29 28.2		12.8	164 33.0	13.6	10	33.3	8.1	54.9
	15	Y	44 27.9	··	12.6	179 05.6	13.6	10	25.2	8.1	54.9
	16		59 27.6		12.5	193 38.2	13.6	10	17.1	8.2	54.9
	17		74 27.3		12.3	208 10.8	13.6	10	08.9	8.2	55.0
	18		89 27.0	S23	12.2	222 43.4	13.6	N10	00.7	8.3	55.0
	19		104 26.7		12.0	237 16.0	13.6	9	52.4	8.3	55.0
	20		119 26.4		11.9	251 48.6	13.6	9	44.1	8.4	55.0
	21		134 26.1	··	11.7	266 21.2	13.6	9	35.7	8.4	55.0
	22		149 25.8		11.6	280 53.8	13.6	9	27.3	8.5	55.1
	23		164 25.5		11.4	295 26.4	13.7	9	18.8	8.5	55.1
			S.D. 16.3	d	0.1	S.D.	14.8		14.8		14.9

Lat.	Twilight		Sunrise	Moonrise			
	Naut.	Civil		27	28	29	30
°	h m	h m	h m	h m	h m	h m	h m
N 72	08 27	10 53	■	15 38	17 22	19 03	20 43
N 70	08 07	09 54	■	16 17	17 47	19 19	20 52
68	07 51	09 20	■	16 44	18 07	19 32	20 59
66	07 38	08 55	10 34	17 05	18 22	19 42	21 05
64	07 27	08 36	09 53	17 21	18 34	19 51	21 10
62	07 18	08 20	09 25	17 34	18 45	19 58	21 14
60	07 10	08 06	09 04	17 46	18 54	20 05	21 18
N 58	07 02	07 55	08 46	17 55	19 01	20 10	21 21
56	06 55	07 44	08 32	18 04	19 08	20 15	21 24
54	06 49	07 35	08 19	18 12	19 14	20 20	21 27
52	06 44	07 27	08 08	18 19	19 20	20 24	21 29
50	06 38	07 20	07 58	18 25	19 25	20 27	21 31
45	06 27	07 04	07 38	18 38	19 36	20 35	21 36
N 40	06 17	06 51	07 21	18 49	19 45	20 42	21 40
35	06 07	06 39	07 07	18 58	19 52	20 47	21 44
30	05 59	06 28	06 55	19 06	19 59	20 52	21 47
20	05 42	06 10	06 34	19 20	20 11	21 01	21 52
N 10	05 26	05 52	06 15	19 33	20 21	21 08	21 56
0	05 09	05 35	05 58	19 44	20 30	21 15	22 01
S 10	04 50	05 17	05 40	19 56	20 40	21 22	22 05
20	04 28	04 57	05 21	20 08	20 50	21 30	22 09
30	03 59	04 32	05 00	20 22	21 01	21 38	22 15
35	03 40	04 17	04 47	20 30	21 08	21 43	22 18
40	03 17	03 59	04 32	20 39	21 15	21 49	22 21
45	02 47	03 36	04 14	20 50	21 24	21 55	22 25
S 50	02 02	03 07	03 51	21 03	21 34	22 03	22 30
52	01 34	02 52	03 41	21 09	21 39	22 06	22 32
54	00 50	02 34	03 28	21 15	21 44	22 10	22 34
56	////	02 12	03 14	21 23	21 50	22 15	22 37
58	////	01 43	02 58	21 31	21 57	22 19	22 39
S 60	////	00 54	02 37	21 40	22 04	22 25	22 43

Lat.	Sunset	Twilight		Moonset			
		Civil	Naut.	27	28	29	30
°	h m	h m	h m	h m	h m	h m	h m
N 72	■	13 10	15 37	11 36	11 27	11 21	11 15
N 70	■	14 09	15 56	10 56	11 01	11 03	11 04
68	■	14 44	16 12	10 28	10 41	10 50	10 56
66	13 30	15 08	16 25	10 07	10 25	10 38	10 48
64	14 11	15 28	16 36	09 50	10 12	10 29	10 42
62	14 38	15 44	16 45	09 37	10 01	10 20	10 37
60	15 00	15 57	16 54	09 25	09 51	10 13	10 32
N 58	15 17	16 09	17 01	09 14	09 43	10 07	10 28
56	15 32	16 19	17 08	09 06	09 35	10 01	10 24
54	15 44	16 28	17 14	08 58	09 29	09 56	10 21
52	15 55	16 36	17 20	08 50	09 23	09 52	10 18
50	16 05	16 43	17 25	08 44	09 18	09 48	10 15
45	16 25	16 59	17 36	08 30	09 06	09 39	10 09
N 40	16 42	17 13	17 47	08 19	08 56	09 31	10 04
35	16 56	17 24	17 56	08 09	08 48	09 25	10 00
30	17 09	17 35	18 05	08 00	08 41	09 19	09 56
20	17 30	17 54	18 21	07 45	08 28	09 09	09 49
N 10	17 48	18 11	18 37	07 32	08 17	09 00	09 43
0	18 05	18 28	18 54	07 20	08 06	08 52	09 37
S 10	18 23	18 46	19 13	07 08	07 56	08 44	09 31
20	18 42	19 06	19 35	06 55	07 45	08 35	09 25
30	19 04	19 31	20 04	06 39	07 32	08 25	09 18
35	19 16	19 46	20 23	06 31	07 24	08 19	09 14
40	19 31	20 04	20 46	06 21	07 15	08 12	09 10
45	19 49	20 27	21 16	06 09	07 05	08 04	09 04
S 50	20 12	20 56	22 01	05 54	06 53	07 55	08 58
52	20 22	21 11	22 28	05 48	06 48	07 50	08 55
54	20 35	21 29	23 12	05 40	06 41	07 45	08 52
56	20 49	21 51	////	05 32	06 34	07 40	08 48
58	21 05	22 20	////	05 22	06 26	07 34	08 44
S 60	21 25	23 07	////	05 11	06 17	07 27	08 39

Day	SUN			MOON			
	Eqn. of Time		Mer. Pass.	Mer. Pass.		Age	Phase
	00ʰ	12ʰ		Upper	Lower		
	m s	m s	h m	h m	h m	d	
27	00 51	01 06	12 01	01 09	13 32	17	
28	01 20	01 35	12 02	01 55	14 18	18	◑
29	01 50	02 04	12 02	02 41	15 04	19	

1977 DEC. 30, 31, 1978 JAN. 1 (FRI., SAT., SUN.)

G.M.T.	ARIES	VENUS −3.5		MARS −0.8		JUPITER −2.3		SATURN +0.6	
	G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.
d h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
30 00	98 19.2	185 28.1	S23 37.9	325 15.2	N21 30.7	8 10.7	N23 12.0	305 29.9	N12 42.7
01	113 21.7	200 27.1	37.9	340 18.2	30.9	23 13.5	12.0	320 32.5	42.7
02	128 24.2	215 26.1	37.9	355 21.3	31.2	38 16.3	12.0	335 35.0	42.8
03	143 26.6	230 25.2	·· 38.0	10 24.3	·· 31.4	53 19.1	·· 12.0	350 37.5	·· 42.8
04	158 29.1	245 24.2	38.0	25 27.4	31.7	68 22.0	12.0	5 40.1	42.9
05	173 31.6	260 23.2	38.0	40 30.4	31.9	83 24.8	12.0	20 42.6	42.9
06	188 34.0	275 22.2	S23 38.1	55 33.5	N21 32.2	98 27.6	N23 12.0	35 45.2	N12 42.9
07	203 36.5	290 21.3	38.1	70 36.5	32.5	113 30.4	12.0	50 47.7	43.0
08	218 38.9	305 20.3	38.1	85 39.5	32.7	128 33.3	12.0	65 50.3	43.0
F 09	233 41.4	320 19.3	·· 38.1	100 42.6	·· 33.0	143 36.1	·· 12.1	80 52.8	·· 43.1
R 10	248 43.9	335 18.4	38.2	115 45.6	33.2	158 38.9	12.1	95 55.3	43.1
I 11	263 46.3	350 17.4	38.2	130 48.7	33.5	173 41.7	12.1	110 57.9	43.1
D 12	278 48.8	5 16.4	S23 38.2	145 51.8	N21 33.8	188 44.6	N23 12.1	126 00.4	N12 43.2
A 13	293 51.3	20 15.4	38.2	160 54.8	34.0	203 47.4	12.1	141 03.0	43.2
Y 14	308 53.7	35 14.5	38.3	175 57.9	34.3	218 50.2	12.1	156 05.5	43.2
15	323 56.2	50 13.5	·· 38.3	191 00.9	·· 34.5	233 53.0	·· 12.1	171 08.1	·· 43.3
16	338 58.7	65 12.5	38.3	206 04.0	34.8	248 55.9	12.1	186 10.6	43.3
17	354 01.1	80 11.6	38.3	221 07.0	35.1	263 58.7	12.1	201 13.1	43.4
18	9 03.6	95 10.6	S23 38.3	236 10.1	N21 35.3	279 01.5	N23 12.1	216 15.7	N12 43.4
19	24 06.1	110 09.6	38.3	251 13.2	35.6	294 04.3	12.1	231 18.2	43.4
20	39 08.5	125 08.7	38.3	266 16.2	35.9	309 07.2	12.1	246 20.8	43.5
21	54 11.0	140 07.7	·· 38.4	281 19.3	·· 36.1	324 10.0	·· 12.1	261 23.3	·· 43.5
22	69 13.4	155 06.7	38.4	296 22.4	36.4	339 12.8	12.1	276 25.9	43.6
23	84 15.9	170 05.7	38.4	311 25.4	36.6	354 15.6	12.1	291 28.4	43.6
31 00	99 18.4	185 04.8	S23 38.4	326 28.5	N21 36.9	9 18.5	N23 12.1	306 31.0	N12 43.6
01	114 20.8	200 03.8	38.4	341 31.6	37.2	24 21.3	12.2	321 33.5	43.7
02	129 23.3	215 02.8	38.4	356 34.7	37.4	39 24.1	12.2	336 36.0	43.7
03	144 25.8	230 01.9	·· 38.4	11 37.7	·· 37.7	54 26.9	·· 12.2	351 38.6	·· 43.8
04	159 28.2	245 00.9	38.4	26 40.8	38.0	69 29.8	12.2	6 41.1	43.8
05	174 30.7	259 59.9	38.4	41 43.9	38.2	84 32.6	12.2	21 43.7	43.8
06	189 33.2	274 58.9	S23 38.4	56 47.0	N21 38.5	99 35.4	N23 12.2	36 46.2	N12 43.9
07	204 35.6	289 58.0	38.4	71 50.0	38.8	114 38.2	12.2	51 48.8	43.9
S 08	219 38.1	304 57.0	38.4	86 53.1	39.0	129 41.1	12.2	66 51.3	44.0
A 09	234 40.6	319 56.0	·· 38.4	101 56.2	·· 39.3	144 43.9	·· 12.2	81 53.9	·· 44.0
T 10	249 43.0	334 55.1	38.4	116 59.3	39.5	159 46.7	12.2	96 56.4	44.0
U 11	264 45.5	349 54.1	38.4	132 02.4	39.8	174 49.5	12.2	111 59.0	44.1
R 12	279 47.9	4 53.1	S23 38.4	147 05.5	N21 40.1	189 52.3	N23 12.2	127 01.5	N12 44.1
D 13	294 50.4	19 52.1	38.4	162 08.6	40.3	204 55.2	12.2	142 04.1	44.2
A 14	309 52.9	34 51.2	38.3	177 11.7	40.6	219 58.0	12.2	157 06.6	44.2
Y 15	324 55.3	49 50.2	·· 38.3	192 14.7	·· 40.9	235 00.8	·· 12.2	172 09.2	·· 44.2
16	339 57.8	64 49.2	38.3	207 17.8	41.1	250 03.6	12.2	187 11.7	44.3
17	355 00.3	79 48.3	38.3	222 20.9	41.4	265 06.5	12.3	202 14.3	44.3
18	10 02.7	94 47.3	S23 38.3	237 24.0	N21 41.7	280 09.3	N23 12.3	217 16.8	N12 44.4
19	25 05.2	109 46.3	38.3	252 27.1	41.9	295 12.1	12.3	232 19.4	44.4
20	40 07.7	124 45.3	38.2	267 30.2	42.2	310 14.9	12.3	247 21.9	44.4
21	55 10.1	139 44.4	·· 38.2	282 33.3	·· 42.5	325 17.7	·· 12.3	262 24.5	·· 44.5
22	70 12.6	154 43.4	38.2	297 36.4	42.8	340 20.6	12.3	277 27.0	44.5
23	85 15.0	169 42.4	38.2	312 39.5	43.0	355 23.4	12.3	292 29.5	44.6
1 00	100 17.5	184 41.5	S23 38.2	327 42.6	N21 43.3	10 26.2	N23 12.3	307 32.1	N12 44.6
01	115 20.0	199 40.5	38.1	342 45.7	43.6	25 29.0	12.3	322 34.6	44.6
02	130 22.4	214 39.5	38.1	357 48.9	43.8	40 31.9	12.3	337 37.2	44.7
03	145 24.9	229 38.5	·· 38.1	12 52.0	·· 44.1	55 34.7	·· 12.3	352 39.7	·· 44.7
04	160 27.4	244 37.6	38.1	27 55.1	44.4	70 37.5	12.3	7 42.3	44.8
05	175 29.8	259 36.6	38.0	42 58.2	44.6	85 40.3	12.3	22 44.8	44.8
06	190 32.3	274 35.6	S23 38.0	58 01.3	N21 44.9	100 43.1	N23 12.3	37 47.4	N12 44.9
07	205 34.8	289 34.7	38.0	73 04.4	45.2	115 46.0	12.3	52 49.9	44.9
08	220 37.2	304 33.7	37.9	88 07.5	45.5	130 48.8	12.3	67 52.5	44.9
S 09	235 39.7	319 32.7	·· 37.9	103 10.6	·· 45.7	145 51.6	·· 12.3	82 55.1	·· 45.0
U 10	250 42.2	334 31.7	37.9	118 13.8	46.0	160 54.4	12.4	97 57.6	45.0
N 11	265 44.6	349 30.8	37.8	133 16.9	46.3	175 57.2	12.4	113 00.2	45.1
D 12	280 47.1	4 29.8	S23 37.8	148 20.0	N21 46.5	191 00.1	N23 12.4	128 02.7	N12 45.1
A 13	295 49.5	19 28.8	37.7	163 23.1	46.8	206 02.9	12.4	143 05.3	45.1
Y 14	310 52.0	34 27.9	37.7	178 26.3	47.1	221 05.7	12.4	158 07.8	45.2
15	325 54.5	49 26.9	·· 37.7	193 29.4	·· 47.4	236 08.5	·· 12.4	173 10.4	·· 45.2
16	340 56.9	64 25.9	37.6	208 32.5	47.6	251 11.3	12.4	188 12.9	45.3
17	355 59.4	79 24.9	37.6	223 35.6	47.9	266 14.2	12.4	203 15.5	45.3
18	11 01.9	94 24.0	S23 37.5	238 38.8	N21 48.2	281 17.0	N23 12.4	218 18.0	N12 45.4
19	26 04.3	109 23.0	37.5	253 41.9	48.4	296 19.8	12.4	233 20.6	45.4
20	41 06.8	124 22.0	37.4	268 45.0	48.7	311 22.6	12.4	248 23.1	45.4
21	56 09.3	139 21.1	·· 37.4	283 48.2	·· 49.0	326 25.4	·· 12.4	263 25.7	·· 45.5
22	71 11.7	154 20.1	37.3	298 51.3	49.3	341 28.3	12.4	278 28.2	45.5
23	86 14.2	169 19.1	37.3	313 54.4	49.5	356 31.1	12.4	293 30.8	45.6
Mer. Pass.	h m 17 19.9	v −1.0	d 0.0	v 3.1	d 0.3	v 2.8	d 0.0	v 2.5	d 0.0

STARS		
Name	S.H.A.	Dec.
	° ′	° ′
Acamar	315 38.4	S40 23.8
Achernar	335 46.6	S57 21.2
Acrux	173 39.1	S62 58.4
Adhara	255 33.1	S28 56.6
Aldebaran	291 19.8	N16 27.9
Alioth	166 44.3	N56 04.5
Alkaid	153 20.2	N49 25.2
Al Na'ir	28 17.6	S47 04.2
Alnilam	276 13.2	S 1 13.1
Alphard	218 22.1	S 8 33.9
Alphecca	126 33.9	N26 47.3
Alpheratz	358 11.2	N28 58.3
Altair	62 34.6	N 8 48.7
Ankaa	353 42.1	S42 25.8
Antares	112 59.4	S26 22.9
Arcturus	146 20.3	N19 17.7
Atria	108 25.8	S68 59.1
Avior	234 28.3	S59 26.3
Bellatrix	279 00.4	N 6 19.7
Betelgeuse	271 29.9	N 7 24.1
Canopus	264 07.4	S52 41.2
Capella	281 13.5	N45 58.5
Deneb	49 50.1	N45 12.3
Denebola	183 00.8	N14 41.6
Diphda	349 22.7	S18 06.6
Dubhe	194 24.2	N61 51.8
Elnath	278 46.1	N28 35.3
Eltanin	90 59.1	N51 29.6
Enif	34 13.6	N 9 46.5
Fomalhaut	15 53.6	S29 44.5
Gacrux	172 30.6	S56 59.1
Gienah	176 19.8	S17 25.1
Hadar	149 26.1	S60 15.7
Hamal	328 30.8	N23 21.6
Kaus Aust.	84 19.7	S34 23.6
Kochab	137 19.8	N74 14.5
Markab	14 05.1	N15 05.3
Menkar	314 42.8	N 4 00.2
Menkent	148 39.3	S36 15.5
Miaplacidus	221 44.4	S69 37.5
Mirfak	309 18.3	N49 47.1
Nunki	76 31.8	S26 19.4
Peacock	54 01.9	S56 48.4
Pollux	244 00.0	N28 04.6
Procyon	245 27.4	N 5 16.8
Rasalhague	96 31.6	N12 34.6
Regulus	208 11.7	N12 04.3
Rigel	281 37.4	S 8 13.8
Rigil Kent.	140 28.5	S60 44.3
Sabik	102 43.5	S15 41.8
Schedar	350 11.0	N56 25.3
Shaula	96 58.6	S37 05.2
Sirius	258 57.0	S16 41.3
Spica	158 59.5	S11 02.7
Suhail	223 11.7	S43 20.6
Vega	80 57.5	N38 45.9
Zuben'ubi	137 35.2	S15 56.9

	S.H.A.	Mer. Pass.
	° ′	h m
Venus	85 46.4	11 40
Mars	227 10.1	2 14
Jupiter	270 00.1	23 18
Saturn	207 12.6	3 33

	G.M.T.	SUN G.H.A.	SUN Dec.	MOON G.H.A.	MOON *v*	MOON Dec.	MOON *d*	MOON H.P.
	d h	° ′	° ′	° ′	′	° ′	′	′
	30 00	179 25.2	S23 11.2	309 59.1	13.6	N 9 10.3	8.6	55.1
	01	194 24.9	11.1	324 31.7	13.6	9 01.7	8.6	55.1
	02	209 24.6	10.9	339 04.3	13.7	8 53.1	8.6	55.1
	03	224 24.3	·· 10.8	353 37.0	13.6	8 44.5	8.7	55.2
	04	239 24.0	10.6	8 09.6	13.7	8 35.8	8.8	55.2
	05	254 23.7	10.4	22 42.3	13.7	8 27.0	8.7	55.2
	06	269 23.4	S23 10.3	37 15.0	13.6	N 8 18.3	8.9	55.2
	07	284 23.1	10.1	51 47.6	13.7	8 09.4	8.8	55.2
	08	299 22.8	10.0	66 20.3	13.6	8 00.6	8.9	55.3
F	09	314 22.5	·· 09.8	80 52.9	13.7	7 51.7	9.0	55.3
R	10	329 22.2	09.6	95 25.6	13.7	7 42.7	9.0	55.3
I	11	344 21.9	09.5	109 58.3	13.6	7 33.7	9.0	55.3
D	12	359 21.6	S23 09.3	124 30.9	13.7	N 7 24.7	9.1	55.3
A	13	14 21.3	09.1	139 03.6	13.6	7 15.6	9.1	55.4
Y	14	29 21.0	09.0	153 36.2	13.7	7 06.5	9.1	55.4
	15	44 20.7	·· 08.8	168 08.9	13.6	6 57.4	9.2	55.4
	16	59 20.4	08.6	182 41.5	13.7	6 48.2	9.2	55.4
	17	74 20.1	08.5	197 14.2	13.6	6 39.0	9.3	55.5
	18	89 19.8	S23 08.3	211 46.8	13.7	N 6 29.7	9.3	55.5
	19	104 19.5	08.1	226 19.5	13.6	6 20.4	9.3	55.5
	20	119 19.2	07.9	240 52.1	13.6	6 11.1	9.4	55.5
	21	134 18.9	·· 07.8	255 24.7	13.7	6 01.7	9.4	55.5
	22	149 18.6	07.6	269 57.4	13.6	5 52.3	9.4	55.6
	23	164 18.3	07.4	284 30.0	13.6	5 42.9	9.5	55.6
	31 00	179 18.0	S23 07.2	299 02.6	13.6	N 5 33.4	9.5	55.6
	01	194 17.7	07.1	313 35.2	13.6	5 23.9	9.5	55.6
	02	209 17.4	06.9	328 07.8	13.6	5 14.4	9.5	55.7
	03	224 17.1	·· 06.7	342 40.4	13.6	5 04.9	9.6	55.7
	04	239 16.8	06.5	357 13.0	13.5	4 55.3	9.7	55.7
	05	254 16.5	06.4	11 45.5	13.6	4 45.6	9.6	55.7
	06	269 16.2	S23 06.2	26 18.1	13.5	N 4 36.0	9.7	55.8
	07	284 15.9	06.0	40 50.6	13.5	4 26.3	9.7	55.8
S	08	299 15.6	05.8	55 23.1	13.6	4 16.6	9.7	55.8
A	09	314 15.3	·· 05.6	69 55.7	13.5	4 06.9	9.8	55.9
T	10	329 15.0	05.4	84 28.2	13.5	3 57.1	9.8	55.9
U	11	344 14.7	05.3	99 00.7	13.4	3 47.3	9.8	55.9
R	12	359 14.4	S23 05.1	113 33.1	13.5	N 3 37.5	9.8	55.9
D	13	14 14.1	04.9	128 05.6	13.4	3 27.7	9.9	56.0
A	14	29 13.8	04.7	142 38.0	13.4	3 17.8	9.9	56.0
Y	15	44 13.5	·· 04.5	157 10.4	13.4	3 07.9	9.9	56.0
	16	59 13.2	04.3	171 42.8	13.4	2 58.0	9.9	56.0
	17	74 12.9	04.1	186 15.2	13.4	2 48.1	10.0	56.1
	18	89 12.6	S23 03.9	200 47.6	13.3	N 2 38.1	9.9	56.1
	19	104 12.3	03.8	215 19.9	13.4	2 28.2	10.0	56.1
	20	119 12.0	03.6	229 52.3	13.3	2 18.2	10.0	56.2
	21	134 11.7	·· 03.4	244 24.6	13.2	2 08.2	10.1	56.2
	22	149 11.4	03.2	258 56.8	13.3	1 58.1	10.0	56.2
	23	164 11.1	03.0	273 29.1	13.2	1 48.1	10.1	56.2
	1 00	179 10.8	S23 02.8	288 01.3	13.2	N 1 38.0	10.1	56.3
	01	194 10.5	02.6	302 33.5	13.2	1 27.9	10.1	56.3
	02	209 10.2	02.4	317 05.7	13.2	1 17.8	10.1	56.3
	03	224 10.0	·· 02.2	331 37.9	13.1	1 07.7	10.2	56.4
	04	239 09.7	02.0	346 10.0	13.1	0 57.5	10.1	56.4
	05	254 09.4	01.8	0 42.1	13.1	0 47.4	10.2	56.4
	06	269 09.1	S23 01.6	15 14.2	13.0	N 0 37.2	10.2	56.4
	07	284 08.8	01.4	29 46.2	13.0	0 27.0	10.1	56.5
	08	299 08.5	01.2	44 18.2	13.0	0 16.9	10.2	56.5
S	09	314 08.2	·· 01.0	58 50.2	12.9	N 0 06.7	10.3	56.5
U	10	329 07.9	00.8	73 22.1	13.0	S 0 03.6	10.2	56.6
N	11	344 07.6	00.6	87 54.1	12.8	0 13.8	10.2	56.6
D	12	359 07.3	S23 00.4	102 25.9	12.9	S 0 24.0	10.3	56.6
A	13	14 07.0	00.2	116 57.8	12.8	0 34.3	10.2	56.7
Y	14	29 06.7	23 00.0	131 29.6	12.8	0 44.5	10.3	56.7
	15	44 06.4	22 59.8	146 01.4	12.7	0 54.8	10.2	56.7
	16	59 06.1	59.6	160 33.1	12.7	1 05.0	10.3	56.8
	17	74 05.8	59.4	175 04.8	12.7	1 15.3	10.3	56.8
	18	89 05.5	S22 59.1	189 36.5	12.6	S 1 25.6	10.3	56.8
	19	104 05.2	58.9	204 08.1	12.6	1 35.9	10.3	56.9
	20	119 04.9	58.7	218 39.7	12.6	1 46.2	10.2	56.9
	21	134 04.6	·· 58.5	233 11.3	12.5	1 56.4	10.3	56.9
	22	149 04.3	58.3	247 42.8	12.4	2 06.7	10.3	57.0
	23	164 04.1	58.1	262 14.2	12.5	2 17.0	10.3	57.0
		S.D. 16.3	*d* 0.2	S.D. 15.1		15.2		15.4

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Moonrise 30	Moonrise 31	Moonrise 1	Moonrise 2
°	h m	h m	h m	h m	h m	h m	h m
N 72	08 25	10 46	▬	20 43	22 23	24 05	00 05
N 70	08 06	09 51	▬	20 52	22 25	24 02	00 02
68	07 50	09 18	▬	20 59	22 28	23 59	25 33
66	07 38	08 54	10 30	21 05	22 29	23 56	25 26
64	07 27	08 35	09 51	21 10	22 31	23 54	25 20
62	07 18	08 19	09 24	21 14	22 32	23 52	25 15
60	07 10	08 06	09 03	21 18	22 33	23 51	25 10
N 58	07 02	07 55	08 46	21 21	22 34	23 49	25 06
56	06 56	07 45	08 32	21 24	22 35	23 48	25 03
54	06 50	07 36	08 19	21 27	22 36	23 47	25 00
52	06 44	07 28	08 08	21 29	22 37	23 46	24 57
50	06 39	07 20	07 59	21 31	22 37	23 45	24 54
45	06 27	07 05	07 38	21 36	22 39	23 43	24 49
N 40	06 17	06 51	07 22	21 40	22 40	23 41	24 44
35	06 08	06 40	07 08	21 44	22 41	23 40	24 40
30	06 00	06 29	06 56	21 47	22 42	23 38	24 37
20	05 43	06 11	06 35	21 52	22 43	23 36	24 31
N 10	05 27	05 54	06 16	21 56	22 45	23 34	24 26
0	05 11	05 37	05 59	22 01	22 46	23 33	24 21
S 10	04 52	05 19	05 42	22 05	22 47	23 31	24 16
20	04 30	04 59	05 23	22 09	22 49	23 29	24 11
30	04 01	04 34	05 02	22 15	22 51	23 27	24 05
35	03 43	04 19	04 49	22 18	22 51	23 26	24 02
40	03 20	04 01	04 34	22 21	22 53	23 25	23 58
45	02 50	03 39	04 16	22 25	22 54	23 23	23 54
S 50	02 05	03 10	03 54	22 30	22 55	23 21	23 49
52	01 39	02 55	03 43	22 32	22 56	23 21	23 47
54	00 57	02 38	03 31	22 34	22 57	23 20	23 44
56	////	02 16	03 17	22 37	22 58	23 19	23 41
58	////	01 47	03 01	22 39	22 58	23 18	23 38
S 60	////	01 02	02 41	22 43	22 59	23 16	23 35

Lat.	Sunset	Twilight Civil	Twilight Naut.	Moonset 30	Moonset 31	Moonset 1	Moonset 2
°	h m	h m	h m	h m	h m	h m	h m
N 72	▬	13 20	15 41	11 15	11 09	11 04	10 58
N 70	▬	14 15	16 01	11 04	11 05	11 04	11 04
68	▬	14 48	16 16	10 56	11 00	11 05	11 09
66	13 36	15 12	16 29	10 48	10 57	11 05	11 14
64	14 16	15 32	16 39	10 42	10 54	11 05	11 17
62	14 43	15 47	16 49	10 37	10 52	11 06	11 20
60	15 03	16 00	16 57	10 32	10 49	11 06	11 23
N 58	15 20	16 12	17 04	10 28	10 47	11 06	11 26
56	15 35	16 22	17 11	10 24	10 45	11 06	11 28
54	15 47	16 31	17 17	10 21	10 44	11 06	11 30
52	15 58	16 39	17 22	10 18	10 42	11 07	11 32
50	16 08	16 46	17 27	10 15	10 41	11 07	11 33
45	16 28	17 02	17 39	10 09	10 38	11 07	11 37
N 40	16 44	17 15	17 49	10 04	10 36	11 07	11 40
35	16 58	17 26	17 58	10 00	10 33	11 07	11 42
30	17 11	17 37	18 07	09 56	10 32	11 07	11 45
20	17 31	17 55	18 23	09 49	10 28	11 08	11 49
N 10	17 50	18 12	18 39	09 43	10 25	11 08	11 52
0	18 07	18 29	18 55	09 37	10 22	11 08	11 55
S 10	18 24	18 47	19 14	09 31	10 20	11 08	11 59
20	18 43	19 07	19 36	09 25	10 16	11 09	12 02
30	19 04	19 32	20 05	09 18	10 13	11 09	12 06
35	19 17	19 47	20 23	09 14	10 11	11 09	12 08
40	19 32	20 05	20 46	09 10	10 09	11 09	12 11
45	19 50	20 27	21 16	09 04	10 06	11 09	12 14
S 50	20 12	20 56	22 00	08 58	10 03	11 09	12 18
52	20 22	21 11	22 26	08 55	10 01	11 09	12 19
54	20 34	21 28	23 07	08 52	10 00	11 09	12 21
56	20 48	21 49	////	08 48	09 58	11 09	12 23
58	21 04	22 17	////	08 44	09 56	11 09	12 25
S 60	21 24	23 02	////	08 39	09 53	11 10	12 28

Day	SUN Eqn. of Time 00ʰ	SUN Eqn. of Time 12ʰ	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age	MOON Phase
	m s	m s	h m	h m	h m	d	
30	02 19	02 33	12 03	03 26	15 49	20	
31	02 47	03 02	12 03	04 11	16 34	21	◑
1	03 16	03 30	12 04	04 57	17 20	22	

EXPLANATION

PRINCIPLE AND ARRANGEMENT

1. *Object.* The object of this Almanac is to provide, in a convenient form, the data required for the practice of astronomical navigation at sea.

2. *Principle.* The main contents of the Almanac consist of data from which the *Greenwich Hour Angle* (G.H.A.) and the *Declination* (Dec.) of all the bodies used for navigation can be obtained for any instant of *Greenwich Mean Time* (G.M.T.). The *Local Hour Angle* (L.H.A.) can then be obtained by means of the formula:

$$\text{L.H.A.} = \text{G.H.A.} \begin{matrix} - \text{ west} \\ + \text{ east} \end{matrix} \text{ longitude}$$

The remaining data consist of: times of rising and setting of the Sun and Moon, and times of twilight; miscellaneous calendarial and planning data and auxiliary tables, including a list of Standard Times; corrections to be applied to observed altitude.

For the Sun, Moon, and planets the G.H.A. and Dec. are tabulated directly for each hour of G.M.T. throughout the year. For the stars the *Sidereal Hour Angle* (S.H.A.) is given, and the G.H.A. is obtained from:

$$\text{G.H.A. Star} = \text{G.H.A. Aries} + \text{S.H.A. Star}$$

The S.H.A. and Dec. of the stars change slowly and may be regarded as constant over periods of several days. G.H.A. Aries, or the Greenwich Hour Angle of the first point of Aries (the Vernal Equinox), is tabulated for each hour. Permanent tables give the appropriate increments and corrections to the tabulated hourly values of G.H.A. and Dec. for the minutes and seconds of G.M.T.

The tabular accuracy is $0'\cdot 1$ throughout. The time argument on the daily pages of this Almanac is 12^{h} + the Greenwich Hour Angle of the mean sun and is denoted by G.M.T. This scale* may differ from the broadcast time signals by an amount which, if ignored, will introduce an error of up to $0'\cdot 2$ in longitude determined from astronomical observations. (The difference arises because the time argument depends on the variable rate of rotation of the Earth while the broadcast time signals are now based on an atomic time-scale.) Step adjustments of exactly one second are made to the time signals as required (normally at 24^{h} on December 31 and June 30) so that the difference between the time signals and G.M.T., as used in this Almanac, may not exceed $0^{s}\cdot 7$. Those who require to reduce observations to a precision of better than 1^{s} must therefore obtain the correction to the time signals from coding in the signal, or from other sources. The correction may be applied to each of the times of observation: alternatively, the longitude, when determined from astronomical observations, may be corrected by the corresponding amount shown in the following table:

Correction to time signals	Correction to longitude
$-0^{s}\cdot 7$	$0'\cdot 2$ to east
$-0^{s}\cdot 6$ to $-0^{s}\cdot 3$	$0'\cdot 1$ to east
$-0^{s}\cdot 2$ to $+0^{s}\cdot 2$	no correction
$+0^{s}\cdot 3$ to $+0^{s}\cdot 6$	$0'\cdot 1$ to west
$+0^{s}\cdot 7$	$0'\cdot 2$ to west

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*The name universal time (UT) is now often used instead of the name Greenwich Mean Time. The time-scale used in this almanac is denoted by UT1, while the scale of the time signals is denoted by UTC.

3. *Lay-out.* The ephemeral data for three days are presented on an opening of two pages: the left-hand page contains the data for the planets and stars; the right-hand page contains the data for the Sun and Moon, together with times of twilight, sunrise, sunset, moonrise and moonset.

The remaining contents are arranged as follows: for ease of reference the altitude-correction tables are given on pages A2, A3, A4, xxxiv and xxxv; calendar, Moon's phases, eclipses, and planet notes (i.e. data of general interest) precede the main tabulations; the other data follow the main tabulations and are arranged, as far as possible, in order of importance or frequency of use backwards from page xxxv.

MAIN DATA

4. *Daily pages.* The daily pages give the G.H.A. of Aries, the G.H.A. and Dec. of the Sun, Moon, and the four navigational planets, for each hour of G.M.T. For the Moon, values of *v* and *d* are also tabulated for each hour to facilitate the correction of G.H.A. and Dec. to intermediate times; *v* and *d* for the Sun and planets change so slowly that they are given, at the foot of the appropriate columns, once only on the page; *v* is zero for Aries and negligible for the Sun, and is omitted. The S.H.A. and Dec. of the 57 selected stars, arranged in alphabetical order of proper name, are also given.

5. *Stars.* The S.H.A. and Dec. of 173 stars, including the 57 selected stars, are tabulated for each month on pages 268-273; no interpolation is required and the data can be used in precisely the same way as those for the selected stars on the daily pages. The stars are arranged in order of S.H.A.

The list of 173 includes all stars down to magnitude 3·0, together with a few fainter ones to fill the larger gaps. The 57 selected stars have been chosen from amongst these on account of brightness and distribution in the sky; they will suffice for the majority of observations.

The 57 selected stars are known by their proper names, but they are also numbered in descending order of S.H.A. In the list of 173 stars, the constellation names are always given on the left-hand page; on the facing page proper names are given where well-known names exist. Numbers for the selected stars are given in both columns.

Stars which, owing to their declinations, are unsuitable for use with the *Tables of Computed Altitude and Azimuth* (H.O. 214 or H.D. 486) are specially indicated.

An index to the selected stars, containing lists in both alphabetical and numerical order, is given on page xxxiii and is also reprinted on the bookmark.

6. *Increments and corrections.* These tables, printed on tinted paper (pages ii-xxxi) at the back of the Almanac, provide the increments and corrections for minutes and seconds to be applied to the hourly values of G.H.A. and Dec. They consist of sixty tables, one for each minute, separated into two parts: increments to G.H.A. for Sun and planets, Aries, and Moon for every minute and second; and, for each minute, corrections to be applied to G.H.A. and Dec. corresponding to the values of *v* and *d* given on the daily pages.

The increments are based on the following adopted hourly rates of increase of the G.H.A.: Sun and planets, 15° precisely; Aries, 15° 02′·46; Moon, 14° 19′·0. The values of *v* on the daily pages are the excesses of the actual hourly motions over the adopted values; they are generally positive, except for Venus. The tabulated hourly values of the Sun's G.H.A. have been adjusted to reduce to a minimum the error caused by treating *v* as negligible. The values of *d* on the daily pages are the hourly differences of the Dec. For the Moon, the true values of *v* and *d* are given for each hour; otherwise mean values are given for the three days on the page.

7. *Method of entry.* The G.M.T. of an observation is expressed as a day and hour, followed by a number of minutes and seconds. The tabular values of G.H.A. and Dec., and, where necessary, the corresponding values of *v* and *d*, are taken directly from the daily pages for the day and hour of G.M.T.; this hour is always *before* the time of observation. S.H.A. and Dec. of the selected stars are also taken from the daily pages.

The table of Increments and Corrections for the minute of G.M.T. is then selected. For the G.H.A., the increment for minutes and seconds is taken from the appropriate column opposite the seconds of G.M.T.; the *v*-correction is taken from the second part of the same table opposite the value of *v* as given on the daily pages. Both increment and *v*-correction are to be added to the G.H.A., except for Venus when *v* is prefixed by a minus sign and the *v*-correction is to be subtracted. For the Dec. there is no increment, but a *d*-correction is applied in the same way as the *v*-correction; *d* is given without sign on the daily pages and the sign of the correction is to be supplied by inspection of the Dec. column. In many cases the correction may be applied mentally.

8. *Examples.* (a) Sun and Moon. Required the G.H.A. and Dec. of the Sun and Moon on 1977 January 22 at G.M.T. 15^{h} 47^{m} 13^{s}.

		SUN			MOON			
		G.H.A.	Dec.	*d*	G.H.A.	*v*	Dec.	*d*
		° ′	° ′	′	° ′	′	° ′	′
Daily page, Jan. 22^{d} 15^{h}		42 04·7	S.19 36·3	0·6	6 03·0	12·6	S.4 06·6	10·5
Increments for	47^{m} 13^{s}	11 48·3			11 16·0			
v or *d* corrections for	47^{m}		−0·5		+10·0		−8·3	
Sum for	Jan. 22^{d} 15^{h} 47^{m} 13^{s}	53 53·0	S.19 35·8		17 29·0		S.3 58·3	

(b) Planets. Required the L.H.A. and Dec. of (i) Venus on 1977 January 6 at G.M.T. 10^{h} 57^{m} 28^{s} in longitude E. 150° 55′; (ii) Jupiter on 1977 January 6 at G.M.T. 23^{h} 25^{m} 12^{s} in longitude W. 55° 12′.

		VENUS					JUPITER			
		G.H.A.	*v*	Dec.	*d*		G.H.A.	*v*	Dec.	*d*
Daily page, January 6^{d}	(10^{h})	281 19·3	−0·1	S.11 56·1	1·1	(23^{h})	42 16·5	2·6	N.17 10·0	0·0
Increments (planets)	(57^{m} 28^{s})	14 22·0				(25^{m} 12^{s})	6 18·0			
v or *d* corrections	(57^{m})	−0·1		−1·1		(25^{m})	+1·1		0·0	
Sum = G.H.A. and Dec.		295 41·2		S.11 55·0			48 35·6		N.17 10·0	
Longitude	(east)	+150 55·0				(west)	−55 12·0			
Multiples of 360°		−360					+360			
L.H.A. planet		86 36·2					353 23·6			

(c) Stars. Required the G.H.A. and Dec. of (i) *Aldebaran* on 1977 January 22 at G.M.T. 15^{h} 55^{m} 13^{s}; (ii) *Vega* on 1977 January 22 at G.M.T. 16^{h} 02^{m} 45^{s}.

		Aldebaran			*Vega*	
		G.H.A.	Dec.		G.H.A.	Dec.
		° ′	° ′		° ′	° ′
Daily page (S.H.A. and Dec.)		291 20·6	N.16 27·8		80 57·9	N.38 45·7
Daily page (G.H.A. Aries)	(15^{h})	346 50·8		(16^{h})	1 53·3	
Increments (Aries)	(55^{m} 13^{s})	13 50·5		(02^{m} 45^{s})	0 41·4	
Sum = G.H.A. star		652 01·9			83 32·6	
Multiples of 360°		−360				
G.H.A. star		292 01·9			83 32·6	

9. *Polaris* (*Pole Star*) *tables.* The tables on pages 274-276 provide means by which the latitude can be deduced from an observed altitude of *Polaris*, and they also give its azimuth; their use is explained and illustrated on those pages. They are based on the following formula:

$$\text{Latitude} - \text{corrected sextant altitude} = -p \cos h + \tfrac{1}{2} p \sin p \sin^2 h \tan (\text{latitude})$$

where p = polar distance of *Polaris* = 90° − Dec.
h = local hour angle of *Polaris* = L.H.A. Aries + S.H.A.

a_0, which is a function of L.H.A. Aries only, is the value of both terms of the above formula calculated for mean values of the S.H.A. (327° 26′) and Dec. (N. 89° 09′·7) of *Polaris*, for a mean latitude of 50°, and adjusted by the addition of a constant (58′·8). a_1, which is a function of

L.H.A. Aries and latitude, is the excess of the value of the second term over its mean value for latitude 50°, increased by a constant (0′·6) to make it always positive. a_2, which is a function of L.H.A. Aries and date, is the correction to the first term for the variation of *Polaris* from its adopted mean position; it is increased by a constant (0′·6) to make it positive. The sum of the added constants is 1°, so that:

$$\text{Latitude} = \text{corrected sextant altitude} - 1^\circ + a_0 + a_1 + a_2$$

RISING AND SETTING PHENOMENA

10. *General.* On the right-hand daily pages are given the times of sunrise and sunset, of the beginning and end of civil and nautical twilights, and of moonrise and moonset for a range of latitudes from N. 72° to S. 60°. These times, which are given to the nearest minute, are strictly the G.M.T. of the phenomena on the Greenwich meridian; they are given for every day for moonrise and moonset, but only for the middle day of the three on each page for the solar phenomena.

They are approximately the Local Mean Times (L.M.T.) of the corresponding phenomena on other meridians; they can be formally interpolated if desired. The G.M.T. of a phenomenon is obtained from the L.M.T. by:

$$\text{G.M.T.} = \text{L.M.T.} \begin{matrix} + \text{ west} \\ - \text{ east} \end{matrix} \text{longitude}$$

in which the longitude must first be converted to time by the table on page i or otherwise.

Interpolation for latitude can be done mentally or with the aid of Table I on page xxxii.

The following symbols are used to indicate the conditions under which, in high latitudes, some of the phenomena do not occur:

☐ Sun or Moon remains continuously above the horizon;

■ Sun or Moon remains continuously below the horizon;

//// twilight lasts all night.

Basis of the tabulations. At sunrise and sunset 16′ is allowed for semi-diameter and 34′ for horizontal refraction, so that at the times given the Sun's upper limb is on the visible horizon; all times refer to phenomena as seen from sea level with a clear horizon.

At the times given for the beginning and end of twilight, the Sun's zenith distance is 96° for civil, and 102° for nautical twilight. The degree of illumination at the times given for civil twilight (in good conditions and in the absence of other illumination) is such that the brightest stars are visible and the horizon is clearly defined. At the times given for nautical twilight the horizon is in general not visible, and it is too dark for observation with a marine sextant.

Times corresponding to other depressions of the Sun may be obtained by interpolation or, for depressions of more than 12°, less reliably, by extrapolation; times so obtained will be subject to considerable uncertainty near extreme conditions.

At moonrise and moonset allowance is made for semi-diameter, parallax, and refraction (34′), so that at the times given the Moon's upper limb is on the visible horizon as seen from sea level.

11. *Sunrise, sunset, twilight.* The tabulated times may be regarded, without serious error, as the L.M.T. of the phenomena on any of the three days on the page and in any longitude. Precise times may normally be obtained by interpolating the tabular values for latitude and to the correct day and longitude, the latter being expressed as a fraction of a day by dividing it by 360°, positive for west and negative for east longitudes. In the extreme conditions near ☐, ■ or //// interpolation may not be possible in one direction, but accurate times are of little value in these circumstances.

Examples. Required the G.M.T. of (a) the beginning of morning twilights and sunrise on 1977 January 22 for latitude S. 48° 55′, longitude E. 75° 18′; (b) sunset and the end of evening twilights on 1977 January 24 for latitude N. 67° 10′, longitude W. 168° 05′.

	(a)	Twilight		Sunrise	(b)	Sunset	Twilight	
		Nautical	Civil				Civil	Nautical
		d h m	d h m	d h m		d h m	d h m	d h m
From p. 25 L.M.T. for Lat.	S.45°	22 03 25	22 04 09	22 04 44	N. 66°	24 14 57	24 16 07	24 17 15
Corr. to (p. xxxii)	S.48° 55′	−27	−20	−16	N. 67° 10′	−17	−9	−6
Long. (p. i)	E.75° 18′	−5 01	−5 01	−5 01	W.168° 05′	+11 12	+11 12	+11 12
G.M.T.		21 21 57	21 22 48	21 23 27		25 01 52	25 03 10	25 04 21

The L.M.T. are strictly for January 23 (middle date on page) and 0° longitude; for precise times it is necessary to interpolate:

(a) to January $22^{\rm d} - 75^\circ/360^\circ =$ Jan. $21^{\rm d}\cdot 8$, i.e. $\frac{1}{3}(1\cdot 2) = 0\cdot 4$ backwards towards the data for the same latitude interpolated from page 23; the corrections are $-2^{\rm m}$ to nautical twilight, $-2^{\rm m}$ to civil twilight and $-2^{\rm m}$ to sunrise.

(b) to January $24^{\rm d} + 168^\circ/360^\circ =$ Jan. $24^{\rm d}\cdot 5$, i.e. $\frac{1}{3}(1\cdot 5) = 0\cdot 5$ forwards towards the data for the same latitude interpolated from page 27; the corrections are $+8^{\rm m}$ to sunset, $+5^{\rm m}$ to civil twilight, and $+4^{\rm m}$ to nautical twilight.

12. *Moonrise, moonset.* Precise times of moonrise and moonset are rarely needed; a glance at the tables will generally give sufficient indication of whether the Moon is available for observation and of the hours of rising and setting. If needed, precise times may be obtained as follows. Interpolate for latitude, using Table I on page xxxii, on the day wanted and also on the preceding day in east longitudes or the following day in west longitudes; take the difference between these times and interpolate for longitude by applying to the time for the day wanted the correction from Table II on page xxxii, so that the resulting time is between the two times used. In extreme conditions near ☐ or ■ interpolation for latitude or longitude may be possible only in one direction; accurate times are of little value in these circumstances.

To facilitate this interpolation the times of moonrise and moonset are given for four days on each page; where no phenomenon occurs during a particular day (as happens once a month) the time of the phenomenon on the following day, increased by $24^{\rm h}$, is given; extra care must be taken when interpolating between two values, when one of those values exceeds $24^{\rm h}$. In practice it suffices to use the daily difference between the times for the nearest tabular latitude, and generally, to enter Table II with the nearest tabular arguments as in the examples below.

Examples. Required the G.M.T. of moonrise and moonset in latitude S. 47° 10′, longitudes E. 124° 00′ and W. 76° 31′ on 1977 January 22.

	Longitude E. 124° 00′		Longitude W. 76° 31′	
	Moonrise	Moonset	Moonrise	Moonset
	d h m	d h m	d h m	d h m
L.M.T. for Lat. S. 45°	22 08 02	22 20 59	22 08 02	22 20 59
Lat. correction (p. xxxii, Table I)	−02	00	−02	00
Long. correction (p. xxxii, Table II)	−23	−10	+16	+07
Correct L.M.T.	22 07 37	22 20 49	22 08 16	22 21 06
Longitude (p. i)	−8 16	−8 16	+5 06	+5 06
G.M.T.	21 23 21	22 12 33	22 13 22	23 02 12

ALTITUDE CORRECTION TABLES

13. *General.* In general two corrections are given for application to altitudes observed with a marine sextant; additional corrections are required for Venus and Mars and also for very low altitudes.

Tables of the correction for dip of the horizon, due to height of eye above sea level, are given on pages A2 and xxxiv. Strictly this correction should be applied first and subtracted from the sextant altitude to give apparent altitude, which is the correct argument for the other tables.

Separate tables are given of the second correction for the Sun, for stars and planets (on pages A2 and A3), and for the Moon (on pages xxxiv and xxxv). For the Sun, values are given for both lower and upper limbs, for two periods of the year. The star tables are used for the planets, but additional corrections (page A2) are required for Venus and Mars. The Moon tables are in two parts: the main correction is a function of apparent altitude only and is tabulated for the lower limb (30′ must be subtracted to obtain the correction for the upper limb); the other, which is given for both lower and upper limbs, depends also on the horizontal parallax, which has to be taken from the daily pages.

An additional correction, given on page A4, is required for the change in the refraction, due to variations of pressure and temperature from the adopted standard conditions; it may generally be ignored for altitudes greater than 10°, except possibly in extreme conditions. The correction tables for the Sun, stars, and planets are in two parts; only those for altitudes greater than 10° are reprinted on the bookmark.

14. *Critical tables.* Some of the altitude correction tables are arranged as critical tables. In these an interval of apparent altitude (or height of eye) corresponds to a single value of the correction; no interpolation is required. At a "critical" entry the upper of the two possible values of the correction is to be taken. For example, in the table of dip, a correction of −4′·1 corresponds to all values of the height of eye from 5·3 to 5·5 metres (17·5 to 18·3 feet) inclusive.

15. *Examples.* The following examples illustrate the use of the altitude correction tables; the sextant altitudes given are assumed to be taken on 1977 January 22 with a marine sextant at height 5·4 metres (18 feet), temperature −3°C. and pressure 982 mb., the Moon sights being taken at about 10ʰ G.M.T.

	SUN lower limb	SUN upper limb	MOON lower limb	MOON upper limb	VENUS	*Polaris*
	° ′	° ′	° ′	° ′	° ′	° ′
Sextant altitude	21 19·7	3 20·2	33 27·6	26 06·7	4 32·6	49 36·5
Dip, height 5·4 metres (18 feet)	−4·1	−4·1	−4·1	−4·1	−4·1	−4·1
Main correction	+13·8	−29·6	+57·4	+60·5	−10·8	−0·8
−30′ for upper limb (Moon)	—	—	—	−30·0	—	—
L, U correction for Moon	—	—	+4·1	+3·1	—	—
Additional correction for Venus	—	—	—	—	+0·2	—
Additional refraction correction	−0·1	−0·3	0·0	−0·1	−0·3	0·0
Corrected sextant altitude	21 29·3	2 46·2	34 25·0	26 36·1	4 17·6	49 31·6

The main corrections have been taken out with apparent altitude (sextant altitude corrected for dip) as argument, interpolating where possible. These refinements are rarely necessary.

16. *Basis of the corrections.* The table for the dip of the sea horizon is based on the formula:

$$\text{Correction for dip} = -1'{\cdot}76\sqrt{\text{(height of eye in metres)}} = -0'{\cdot}97\sqrt{\text{(height of eye in feet)}}$$

The mean refraction, given explicitly in the correction table for the stars and planets and incorporated into those for the Sun and Moon, is based on Garfinkel's theory and is for a temperature of 10°C. (50°F.) and a pressure of 1010 mb. (29·83 inches). The additional corrections for variations of temperature and pressure from these adopted means are also based on Garfinkel's theory; there is no significant difference between the various theories to the accuracy given.

The correction table for the Sun includes the effects of semi-diameter and parallax, as well as the mean refraction; no correction for irradiation is included.

The additional corrections for Venus and Mars allow for parallax and phase, and are given by $p \cos H - k \cos \theta$, where H is the altitude, θ the angle at the planet between the vertical and the Sun: p and k are, for Venus, for 1977:

	Jan. 1		Feb. 7		Mar. 3		Mar. 19		Apr. 24		May 10		June 1		July 21		Dec. 31
p		0·2		0·3		0·4		0·5		0·4		0·3		0·2		0·1	
k		0·1		0·2		0·3		0·4		0·3		0·2		0·1		0·0	

The corrections given on page A2, and on the bookmark, are mean values applicable, in the case of Venus, only when the Sun is below the horizon. For daylight observations of Venus the observed values of H and θ should be used to calculate the correction directly; the term $-k \cos \theta$ is positive when the Sun is lower than Venus, zero when they have the same altitude, and negative when the Sun is higher.

In the case of the Moon the correction table includes the effects of semi-diameter, parallax and augmentation as well as the mean refraction; no correction for irradiation is included.

17. *Bubble sextant observations.* When observing with a bubble sextant no correction is necessary for dip, semi-diameter, or augmentation. For the stars and planets the corrections given may be used unchanged, and they should also be used for the Sun; for the Moon it is easiest to take the mean of the corrections for lower and upper limbs and subtract 15′ from the altitude; the correction for dip must not be applied.

AUXILIARY AND PLANNING DATA

18. *Sun and Moon.* On the daily pages are given: the semi-diameters and the times of meridian passage of both Sun and Moon over the Greenwich meridian; the equation of time; the horizontal parallax and the age of the Moon, together with a symbol indicating the phase. For the Moon, the semi-diameters for each of the three days are given, in order, at the foot of the column; for the Sun a single value is sufficient. The equation of time is given, without sign, for 00^{h} and 12^{h} G.M.T. on each day. To obtain apparent time, apply the equation of time to mean time with a *positive* sign when G.H.A. Sun at 00^{h} G.M.T. *exceeds* 180°, or at 12^{h} *exceeds* 0°, corresponding to a meridian passage of the Sun *before* 12^{h} G.M.T.; *otherwise* apply with a *negative* sign.

The times of the phases of the Moon are given in G.M.T. on page 4.

19. *Planets.* The magnitudes of the planets are given immediately following their names in the headings on the daily pages; also given, for the middle day of the three on the page, are their S.H.A. at 00^{h} G.M.T. and their times of meridian passage.

The planet notes and diagram on pages 8 and 9 provide descriptive information as to the suitability of the planets for observation during the year, and of their positions and movements.

20. *Stars.* The time of meridian passage of the first point of Aries over the Greenwich meridian is given on the daily pages, for the middle day of the three on the page, to $0^{m}\cdot 1$. The interval between successive meridian passages is $23^{h}\ 56^{m}\cdot 1$ (24^{h} less $3^{m}\cdot 9$) so that times for intermediate days and other meridians can readily be derived. If a precise time is required it may be obtained by finding the G.M.T. at which L.H.A. Aries is zero.

The meridian passage of a star occurs when its L.H.A. is zero, that is when L.H.A. Aries + S.H.A. = 360°. An approximate time can be obtained from the planet diagram on page 9.

The star charts on pages 266 and 267 are intended to assist identification. They show the relative positions of the stars in the sky as seen from the Earth and include all 173 stars used in the Almanac, together with a few others to complete the main constellation configurations. The local meridian at any time may be located on the chart by means of its S.H.A. which is 360° – L.H.A. Aries, or west longitude – G.H.A. Aries.

21. *Star globe.* To set a star globe on which is printed a scale of L.H.A. Aries, first set the globe for latitude and then rotate about the polar axis until the scale under the edge of the meridian circle reads L.H.A. Aries.

To mark the positions of the Sun, Moon, and planets on the star globe, take the difference G.H.A. Aries – G.H.A. body and use this along the L.H.A. Aries scale, in conjunction with the declination, to plot the position. G.H.A. Aries – G.H.A. body is most conveniently found by taking the difference when the G.H.A. of the body is small (less than 15°), which happens once a day.

22. *Calendar.* On page 4 are given lists of ecclesiastical festivals, and of the principal anniversaries and holidays in the British Commonwealth and the United States of America. The calendar on page 5 includes the day of the year as well as the day of the week.

Brief particulars are given, at the foot of page 5, of the solar and lunar eclipses occurring during the year; the times given are in G.M.T. The principal features of the more important solar eclipses are shown on the maps on pages 6 and 7.

23. *Standard times.* The lists on pages 262–265 give the standard times used in most countries. In general no attempt is made to give details of the beginning and end of summer time, since they are liable to frequent changes at short notice.

The Date or Calendar Line is an arbitrary line, on either side of which the date differs by one day; when crossing this line on a westerly course, the date must be advanced one day; when crossing it on an easterly course, the date must be put back one day. The line is a modification of the line of the 180th meridian, and is drawn so as to include, as far as possible, islands of any one group, etc., on the same side of the line. It may be traced by starting at the South Pole and joining up to the following positions:

Lat.	S. 51°·0	S. 45°·0	S. 15°·0	S. 5°·0	N. 48°·0	N. 53°·0	N. 65°·5
Long.	180°·0	W. 172°·5	W. 172°·5	180°·0	180°·0	E. 170°·0	W. 169°·0

thence through the middle of the Diomede Islands to Lat. N.68°·0, Long. W.169°·0, passing east of Ostrov Vrangelya (Wrangel Island) to Lat. N.75°·0, Long. 180°·0, and thence to the North Pole.

ACCURACY

24. *Main data.* The quantities tabulated in this Almanac are generally correct to the nearest 0′·1; the exception is the Sun's G.H.A. which is deliberately adjusted by up to 0′·15 to reduce the error due to ignoring the *v*-correction. The G.H.A. and Dec. at intermediate times cannot be obtained to this precision, since at least two quantities must be added; moreover, the *v*- and *d*-corrections are based on mean values of *v* and *d* and are taken from tables for the whole minute only. The largest error that can occur in the G.H.A. or Dec. of any body other than the Sun or Moon is less than 0′·2; it may reach 0′·25 for the G.H.A. of the Sun and 0′·3 for that of the Moon.

In practice it may be expected that only one third of the values of G.H.A. and Dec. taken out will have errors larger than 0′·05 and less than one-tenth will have errors larger than 0′·1.

25. *Altitude corrections.* The errors in the altitude corrections are nominally of the same order as those in G.H.A. and Dec., as they result from the addition of several quantities each correctly rounded off to 0′·1. But the actual values of the dip and of the refraction at low altitudes may, in extreme atmospheric conditions, differ considerably from the mean values used in the tables.

USE OF THIS ALMANAC IN 1978

This Almanac may be used for the Sun and stars in 1978 in the following manner.

For the Sun, take out the G.H.A. and Dec. for the same date but for a time $5^h\ 48^m\ 00^s$ *earlier* than the G.M.T. of observation; add 87° 00′ to the G.H.A. so obtained. The error, mainly due to planetary perturbations of the Earth, is unlikely to exceed 0′·4.

For the stars, calculate the G.H.A. and Dec. for the same date and the same time, but *subtract* 15′·1 from the G.H.A. so found. The error, due to incomplete correction for precession and nutation, is unlikely to exceed 0′·4. If preferred, the same result can be obtained by using a time $5^h\ 48^m\ 00^s$ earlier than the G.M.T. of observation (as for the Sun) and adding 86° 59′·2 to the G.H.A. (or adding 87° as for the Sun and subtracting 0′·8, for precession, from the S.H.A. of the star).

The Almanac cannot be so used for the Moon or planets.

STANDARD TIMES (Corrected to September 1974)

LIST I—PLACES FAST ON G.M.T. (mainly those EAST OF GREENWICH)

The times given below should be *added* to G.M.T. to give Standard Time. / *subtracted* from Standard Time to give G.M.T.

	h	m
Aden (Southern Yemen)	03	
Admiralty Islands	10	
Afghanistan	04	30
Albania*	01	
Amirante Islands	04	
Andaman Islands	05	30
Angola (Portuguese West Africa)	01	
Annobon Island‡	01	
Arabian Emirates, Federation of	04	
Australia		
Australian Capital Territory*	10	
New South Wales[1]*	10	
Northern Territory	09	30
Queensland	10	
South Australia*	09	30
Tasmania*	10	
Victoria*	10	
Western Australia	08	
Austria	01	
Balearic Islands‡*	01	
Bangladesh	06	
Belgium	01	
Botswana, Republic of	02	
British New Guinea	10	
Brunei	08	
Bulgaria	02	
Burma	06	30
Burundi	02	
Cambodia (Khmer Republic)	07	
Cameroun Republic	01	
Caroline Islands, east of long. E. 160°	12	
west of long. E. 160°	10	
Truk, Ponape	11	
Central African Republic	01	
Ceylon (Sri Lanka)	05	30
Chad	01	
Chagos Archipelago	05	
Chatham Islands‡	12	45
China[2]	08	
Christmas Island, Indian Ocean	07	
Cocos Keeling Islands	06	30
Comoro Islands	03	
Congo Republic	01	
Corsica‡	01	
Crete	02	
Cyprus	02	
Czechoslovakia	01	
Dahomey, Republic of	01	
Denmark	01	
Egypt* (United Arab Republic)	02	
Ellice Islands	12	
Equatorial Guinea, Republic of	01	
Estonia	03	
Ethiopia	03	
Fernando Póo‡	01	
Fiji	12	
Finland	02	
Formosa* (Taiwan)	08	
France‡	01	
French Territory of the Afars and Issas	03	
Friendly Islands	13	
Gabon	01	
Germany	01	
Gibraltar‡	01	
Gilbert and Ellice Islands	12	
Greece	02	
Guam	10	
Holland (The Netherlands)	01	
Hong Kong*	08	
Hungary	01	
India	05	30
Indonesia, Republic of		
Bali, Bangka, Billiton, Java, Lombok, Madura, Sumatra	07	
Borneo, Celebes, Flores, Sumba, Sumbawa, Timor	08	
Aru, Kei, Moluccas, Tanimbar, West Irian	09	
Iran	03	30
Iraq	03	
Irish Republic†	01	
Israel	02	
Italy*	01	
Japan	09	
Jordan*	02	
Kamchatka Peninsula	12	
Kenya	03	
Khmer Republic (Cambodia)	07	
Korea	09	
Kuril Islands	11	
Kuwait	03	
Laccadive Islands	05	30
Ladrone Islands	10	
Laos	07	
Latvia	03	
Lebanon*	02	

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* Summer time may be kept in these countries.
† Winter time is kept in this country.
‡ The legal time may differ from that given here.
[1] Except Broken Hill Area which keeps 09^{h} 30^{m}.
[2] All the coast, but some areas may keep summer time.

LIST I—(*continued*)

	h	m
Lesotho	02	
Libya‡	02	
Liechtenstein	01	
Lithuania	03	
Lord Howe Island	10	30
Luxembourg	01	
Macao*	08	
Malagasy Republic	03	
Malawi	02	
Malaysia		
Malaya	07	30
Sabah, Sarawak	08	
Maldive Republic	05	
Malta*	01	
Manchuria	09	
Mariana Islands	10	
Marshall Islands[1]	12	
Mauritius	04	
Monaco‡	01	
Mozambique (Portuguese E. Africa)	02	
Muscat and Oman, Sultanate of	04	
Nauru	11	30
Netherlands, The	01	
New Caledonia	11	
New Guinea, British	10	
New Hebrides‡	12	
New Zealand*	12	
Nicobar Islands	05	30
Niger	01	
Nigeria, Republic of	01	
Norfolk Island	11	30
North Vietnam	07	
Norway	01	
Novaya Zemlya	05	
Ocean Island	11	30
Okinawa	09	
Pakistan	05	
Papua	10	
Persia (Iran)	03	30
Pescadores Islands	08	
Philippine Republic	08	
Poland	01	
Portugal	01	
Portuguese East Africa (Mozambique)	02	
Portuguese West Africa (Angola)	01	
Réunion	04	
Rhodesia, Republic of	02	
Romania	02	
Rwanda	02	
Ryukyu Islands	09	
Sakhalin	11	
Santa Cruz Islands	11	

	h	m
Sardinia	01	
Saudi Arabia	03	
Schouten Islands	09	
Seychelles	04	
Siam (Thailand)	07	
Sicily*	01	
Singapore	07	30
Socotra	03	
Solomon Islands	11	
Somali Republic	03	
South Africa, Republic of	02	
Southern Yemen	03	
South Vietnam	08	
South West Africa	02	
Spain‡*	01	
Spitsbergen (Svalbard)	01	
Sri Lanka (Ceylon)	05	30
Sudan, Republic of	02	
Swaziland	02	
Sweden	01	
Switzerland	01	
Syria* (Syrian Arab Republic)	02	
Taiwan* (Formosa)	08	
Tanzania	03	
Thailand	07	
Timor	08	
Tonga Islands	13	
Truk	11	
Tunisia	01	
Turkey*	02	
Uganda	03	
Union of Soviet Socialist Republics[2]		
west of long. E. 40°	03	
long. E. 40° to E. 52° 30′	04	
long. E. 52° 30′ to E. 67° 30′	05	
long. E. 67° 30′ to E. 82° 30′	06	
long. E. 82° 30′ to E. 97° 30′	07	
long. E. 97° 30′ to E. 112° 30′	08	
long. E. 112° 30′ to E. 127° 30′	09	
long. E. 127° 30′ to E. 142° 30′	10	
long. E. 142° 30′ to E. 157° 30′	11	
long. E. 157° 30′ to E. 172° 30′	12	
east of long. E. 172° 30′	13	
Vietnam, North	07	
(South) Republic of	08	
Wrangell Island	13	
Yugoslavia	01	
Zaire		
Kinshasa, Mbandaka	01	
Orientale, Kivu, Katanga, Kasai	02	
Zambia, Republic of	02	

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* Summer time may be kept in these countries.

‡ The legal time may differ from that given here.

[1] Except the islands of Kwajalein and Eniwetok which keep a time 24^h slow on that of the rest of the islands.

[2] The boundaries between the zones are irregular; the longitudes given are approximate only.

LIST II—PLACES NORMALLY KEEPING G.M.T.

Algeria
Ascension Island
Canary Islands‡*
Channel Islands[1]
Faeroes, The
Gambia
Ghana
Great Britain[1]
Guinea Republic
Iceland
Ifni
Ireland, Northern[1]
Ivory Coast
Liberia
Madeira
Mali
Mauritania
Morocco*
Principe
Rio de Oro‡
St. Helena
São Tomé
Senegal
Sierra Leone
Spanish Sahara
Tangier
Togo Republic
Tristan da Cunha
Upper Volta

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* Summer time may be kept in these countries.

‡ The legal time may differ from that given here.

[1] Summer time, one hour in advance of G.M.T., is kept from March 20^d 02^h to October 23^d 02^h G.M.T.

LIST III—PLACES SLOW ON G.M.T. (WEST OF GREENWICH)

The times given below should be *subtracted* from G.M.T. to give Standard Time. *added* to Standard Time to give G.M.T.

	h	m
Argentina	03	
Austral Islands[1]	10	
Azores	01	
Bahamas*	05	
Barbados	04	
Belize	06	
Bermuda*	04	
Bolivia	04	
Brazil, eastern[2]	03	
Territory of Acre	05	
western	04	
British Antarctic Territory[3]	03	
Canada		
Alberta*	07	
British Columbia*	08	
Labrador*	04	
Manitoba*	06	
New Brunswick*	04	
Newfoundland*	03	30
Northwest Territories*		
east of long. W. 68°	04	
long. W. 68° to W. 85°	05	
long. W. 85° to W. 102°	06	
west of long. W. 102°	07	
Nova Scotia*	04	
Ontario*, east of long. W. 90°	05	
west of long. W. 90°	06	
Prince Edward Island*	04	
Quebec*, east of long. W. 63°	04	
west of long. W. 63°	05	
Saskatchewan*		
east of long. W. 106°	06	
west of long. W. 106°	07	
Yukon, east of long. W. 138°	08	
west of long. W. 138°	09	
Cape Verde Islands*	02	
Cayman Islands	05	

	h	m
Chile*	04	
Christmas Island, Pacific Ocean	10	
Colombia	05	
Cook Islands, except Niue	10	30
Costa Rica	06	
Cuba*	05	
Curaçao Island	04	
Dominican Republic‡	04	
Dutch Guiana (Surinam)	03	30
Easter Island (I. de Pascua)	07	
Ecuador	05	
Falkland Islands[4]	04	
Fanning Island	10	
Fernando de Noronha Island	02	
French Guiana‡	03	
Galápagos Islands	05	
Greenland, Scoresby Sound	02	
Angmagssalik and west coast	03	
Thule area	04	
Grenada	04	
Guadeloupe	04	
Guatemala	06	
Guiana, Dutch	03	30
French‡	03	
Guyana, Republic of	03	45
Haiti	05	
Honduras	06	
Honduras, British (Belize)	06	
Jamaica*	05	
Jan Mayen Island	01	

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* Summer time may be kept in these countries.

‡ The legal time may differ from that given here.

[1] This is the legal standard time, but local mean time is generally used.

[2] Including all the coast and Brasilia.

[3] Except South Georgia which keeps 02^h.

[4] Port Stanley keeps summer time September to March.

LIST III—*(continued)*

	h	m
Johnston Island	10	
Juan Fernandez Islands	04	
Leeward Islands	04	
Low Archipelago	10	
Marquesas Islands[1]	09	30
Martinique	04	
Mexico[2]	06	
Midway Islands	11	
Miquelon	03	
Nicaragua‡*	06	
Niue Island	11	
Panama Canal Zone	05	
Panama, Republic of	05	
Paraguay*	04	
Peru	05	
Portuguese Guinea	01	
Puerto Rico	04	
Rarotonga	10	30
St. Pierre and Miquelon	03	
Salvador, El	06	
Samoa	11	
Society Islands[1]	10	
South Georgia	02	
Surinam (Dutch Guiana)	03	30
Tobago	04	
Trindade Island, South Atlantic	02	
Trinidad	04	
Tuamotu Archipelago[1]	10	
Tubuai Islands[1]	10	
Turks and Caicos Islands	05	
United States of America		
Alabama[3]	06	
Alaska[3], east of long. W. 137°	08	
long. W. 137° to W. 141°	09	
long. W. 141° to W. 161°	10	
long. W. 161° to W. 172° 30′	11	
Aleutian Islands	11	
Arizona	07	
Arkansas[3]	06	
California[3]	08	
Colorado[3]	07	
Connecticut[3]	05	
Delaware[3]	05	
District of Columbia[3]	05	

	h	m
United States of America (continued)		
Florida[3, 4]	05	
Georgia[3]	05	
Hawaii	10	
Idaho[3, 4]	07	
Illinois[3]	06	
Indiana[4]	05	
Iowa[3]	06	
Kansas[3, 4]	06	
Kentucky[3, 4]	05	
Louisiana[3]	06	
Maine[3]	05	
Maryland[3]	05	
Massachusetts[3]	05	
Michigan[3, 4]	05	
Minnesota[3]	06	
Mississippi[3]	06	
Missouri[3]	06	
Montana[3]	07	
Nebraska[3, 4]	06	
Nevada[3]	08	
New Hampshire[3]	05	
New Jersey[3]	05	
New Mexico[3]	07	
New York[3]	05	
North Carolina[3]	05	
North Dakota[3, 4]	06	
Ohio[3]	05	
Oklahoma[3]	06	
Oregon[3, 4]	08	
Pennsylvania[3]	05	
Rhode Island[3]	05	
South Carolina[3]	05	
South Dakota[3], eastern part	06	
western part	07	
Tennessee[3, 4]	06	
Texas[3]	06	
Utah[3, 4]	07	
Vermont[3]	05	
Virginia[3]	05	
Washington, D.C.[3]	05	
Washington[3]	08	
West Virginia[3]	05	
Wisconsin[3]	06	
Wyoming[3]	07	
Uruguay	03	
Venezuela	04	
Virgin Islands	04	
Windward Islands	04	

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* Summer time may be kept in these countries.

‡ The legal time may differ from that given here.

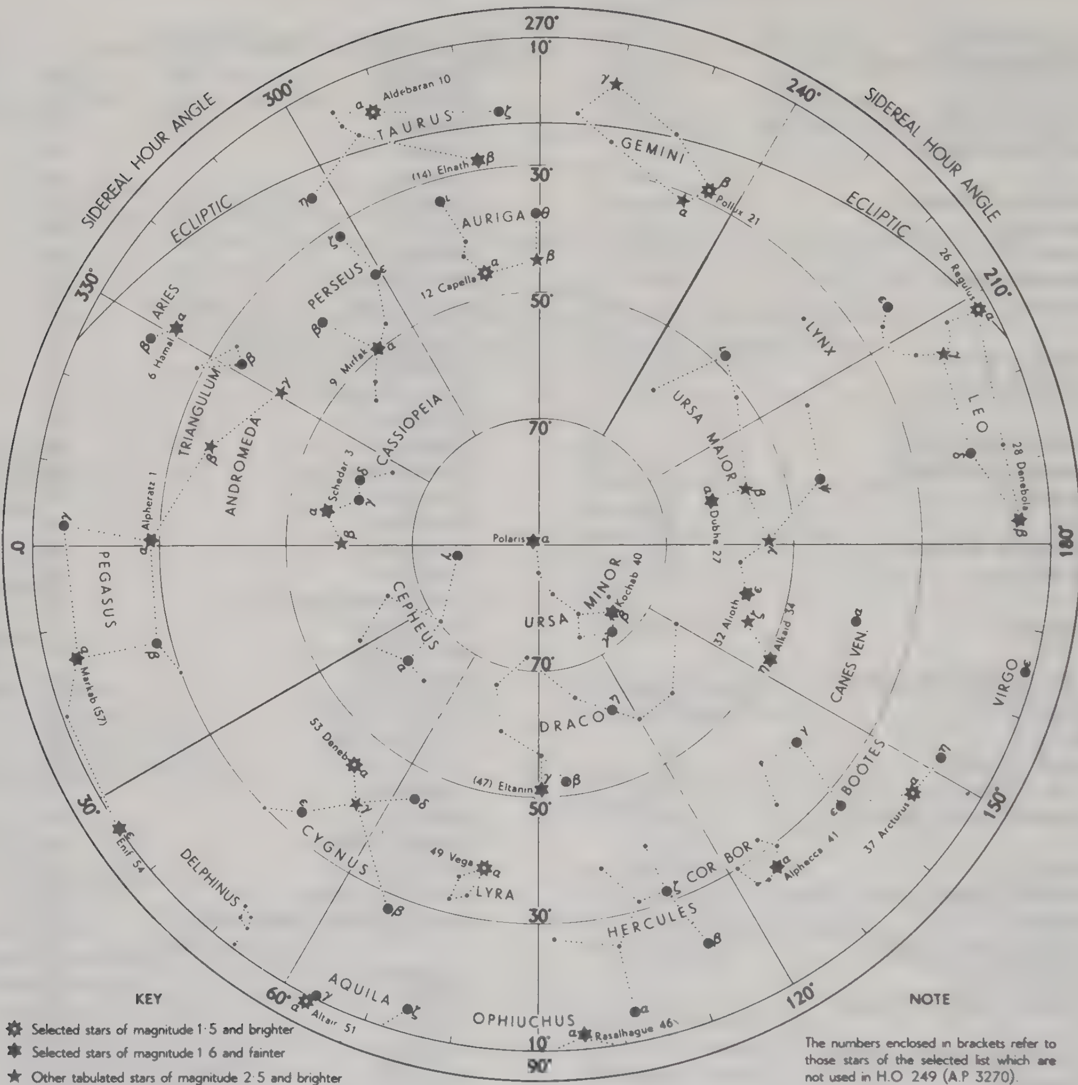
[1] This is the legal standard time, but local mean time is generally used.

[2] Except the states of Sonora, Sinaloa, Nayarit, and the Southern District of Lower California which keep 07^{h}, and the Northern District of Lower California which keeps 08^{h}.

[3] Emergency daylight-saving time, one hour fast on the given time, is kept in these states effective from 1974 January 6 at $02^{h}\ 00^{m}$ local clock time. Summer (daylight-saving) time, one hour fast on the time given, is kept in these states from the last Sunday in April to the last Sunday in October, changing at $02^{h}\ 00^{m}$ local clock time.

[4] This applies to the greater portion of the state.

NORTHERN STARS


270°
240°
210°
180°
150°
120°
90°
60°
30°
0°
330°
300°
SIDEREAL HOUR ANGLE
SIDEREAL HOUR ANGLE
ECLIPTIC
ECLIPTIC
10°
30°
50°
70°
70°
50°
30°
10°
Aldebaran 10
TAURUS
GEMINI
(14) Elnath
AURIGA
Pollux 21
12 Capella
PERSEUS
ARIES
6 Hamal
9 Mirfak
LYNX
26 Regulus
TRIANGULUM
ANDROMEDA
CASSIOPEIA
URSA MAJOR
LEO
28 Denebola
Schedar 3
Alpheratz 1
Dubhe 27
Polaris
PEGASUS
CEPHEUS
URSA MINOR
Kochab 40
32 Alioth
Alkaid 34
CANES VEN.
VIRGO
Markab (57)
DRACO
53 Deneb
(47) Eltanin
BOOTES
37 Arcturus
Alphecca 41
CYGNUS
Enif 54
DELPHINUS
49 Vega
LYRA
COR BOR
HERCULES
AQUILA
Altair 51
OPHIUCHUS
Rasalhague 46

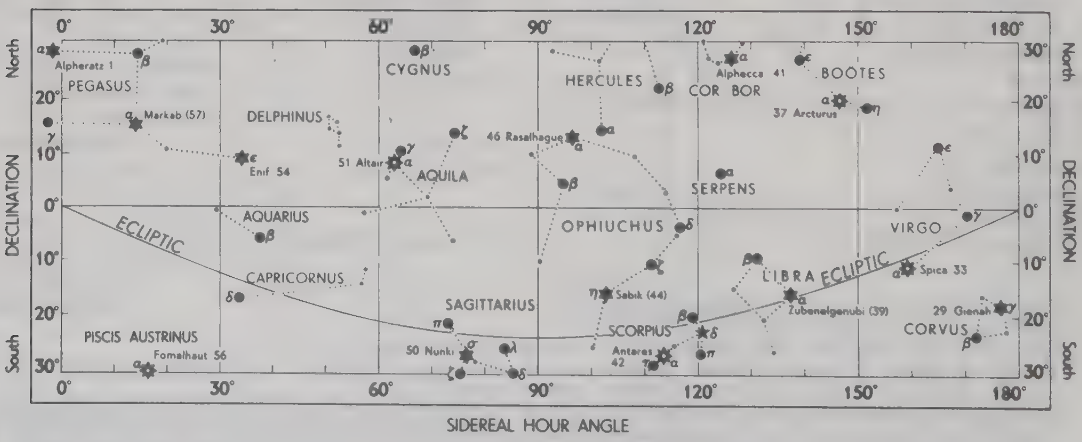
KEY

- Selected stars of magnitude 1·5 and brighter
- Selected stars of magnitude 1 6 and fainter
- Other tabulated stars of magnitude 2·5 and brighter
- Other tabulated stars of magnitude 2 6 and fainter
- Untabulated stars

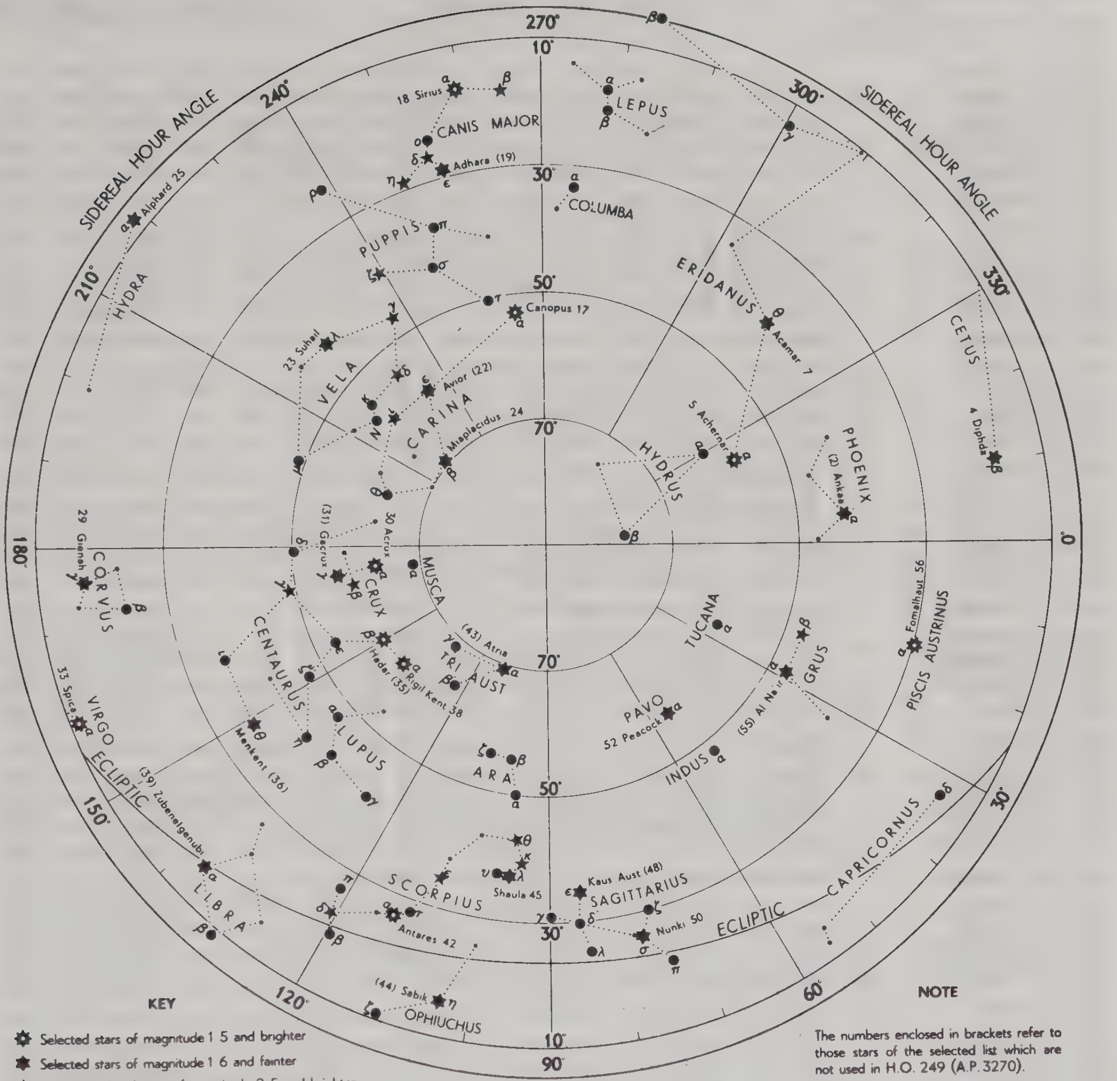
NOTE

The numbers enclosed in brackets refer to those stars of the selected list which are not used in H.O 249 (A.P 3270).

EQUATORIAL STARS (S.H.A. 0° to 180°)


0°
30°
60°
90°
120°
150°
180°
North
South
DECLINATION
DECLINATION
30°
20°
10°
0°
10°
20°
30°
Alpheratz 1
PEGASUS
Markab (57)
DELPHINUS
Enif 54
CYGNUS
51 Altair
AQUILA
AQUARIUS
ECLIPTIC
CAPRICORNUS
PISCIS AUSTRINUS
Fomalhaut 56
SAGITTARIUS
50 Nunki
HERCULES
46 Rasalhague
OPHIUCHUS
SCORPIUS
Antares 42
Sabik (44)
COR BOR
Alphecca 41
SERPENS
BOOTES
37 Arcturus
LIBRA
ECLIPTIC
Zubenelgenubi (39)
Spica 33
VIRGO
29 Gienah
CORVUS
SIDEREAL HOUR ANGLE

SOUTHERN STARS


SIDEREAL HOUR ANGLE
SIDEREAL HOUR ANGLE
270°
240°
300°
210°
330°
180°
0°
150°
30°
120°
60°
90°
10°
30°
50°
70°
70°
50°
30°
10°
18 Sirius
CANIS MAJOR
Adhara (19)
LEPUS
COLUMBA
Alphard 25
HYDRA
PUPPIS
Canopus 17
ERIDANUS
Acamar 7
CETUS
4 Diphda
23 Suhail
VELA
Avior (22)
CARINA
Miaplacidus 24
5 Achernar
HYDRUS
PHOENIX
(2) Ankaa
29 Gienah
CORVUS
(31) Gacrux
30 Acrux
CRUX
MUSCA
Fomalhaut 56
PISCIS AUSTRINUS
TUCANA
GRUS
CENTAURUS
Hadar (35)
Rigil Kent 38
(43) Atria
TRI AUST
33 Spica
VIRGO
ECLIPTIC
Menkent (36)
LUPUS
PAVO
52 Peacock
(55) Al Na'ir
INDUS
ARA
(39) Zubenelgenubi
LIBRA
SCORPIUS
Shaula 45
Antares 42
Kaus Aust (48)
SAGITTARIUS
Nunki 50
ECLIPTIC
CAPRICORNUS
(44) Sabik
OPHIUCHUS

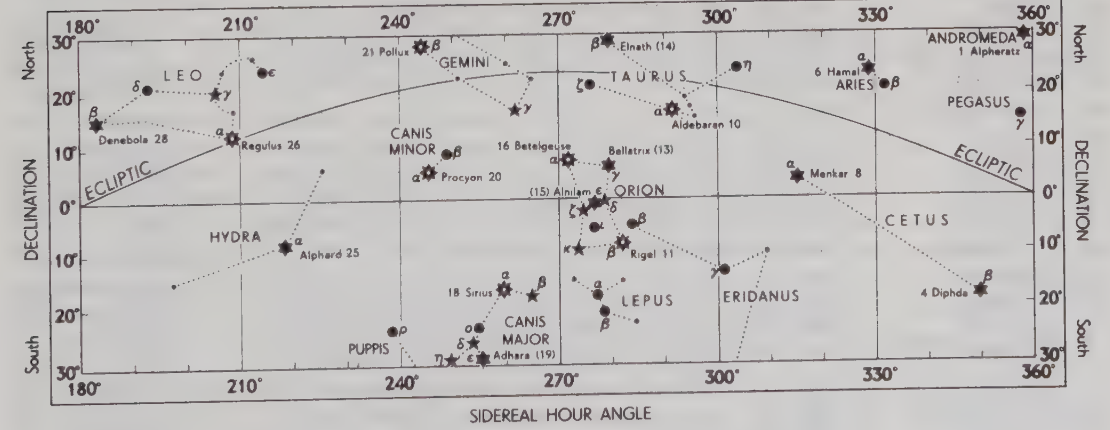
KEY

- ✪ Selected stars of magnitude 1 5 and brighter
- ✸ Selected stars of magnitude 1 6 and fainter
- ★ Other tabulated stars of magnitude 2 5 and brighter
- ● Other tabulated stars of magnitude 2 6 and fainter
- • Untabulated stars

NOTE

The numbers enclosed in brackets refer to those stars of the selected list which are not used in H.O. 249 (A.P. 3270).

EQUATORIAL STARS (S.H.A. 180° to 360°)


180°
210°
240°
270°
300°
330°
360°
North
South
DECLINATION
DECLINATION
30°
20°
10°
0°
10°
20°
30°
LEO
Denebola 28
Regulus 26
ECLIPTIC
21 Pollux
GEMINI
CANIS MINOR
Procyon 20
Elnath (14)
TAURUS
Aldebaran 10
16 Betelgeuse
Bellatrix (13)
(15) Alnilam
ORION
Rigel 11
6 Hamal
ARIES
ANDROMEDA
1 Alpheratz
PEGASUS
ECLIPTIC
Menkar 8
CETUS
4 Diphda
HYDRA
Alphard 25
18 Sirius
CANIS MAJOR
Adhara (19)
PUPPIS
LEPUS
ERIDANUS
SIDEREAL HOUR ANGLE

Mag.	Name and Number			S.H.A.							Dec.						
					JAN.	FEB.	MAR.	APR.	MAY	JUNE		JAN.	FEB.	MAR.	APR.	MAY	JUNE
				°	′	′	′	′	′	′	°	′	′	′	′	′	′
3·4	γ	Cephei †		**5**	24·1	24·6	24·8	24·5	23·9	23·1	**N. 77**	30·6	30·5	30·4	30·2	30·1	30·1
2·6	α	Pegasi	57	**14**	05·8	05·8	05·8	05·7	05·5	05·3	**N. 15**	05·0	04·9	04·9	04·9	04·9	05·0
2·6	β	Pegasi		**14**	20·2	20·2	20·2	20·1	19·9	19·6	**N. 27**	57·7	57·6	57·5	57·4	57·4	57·5
1·3	α	Piscis Aust.	56	**15**	54·4	54·4	54·4	54·3	54·1	53·8	**S. 29**	44·7	44·7	44·6	44·5	44·4	44·3
2·2	β	Gruis		**19**	40·8	40·8	40·8	40·6	40·3	40·0	**S. 46**	60·4	60·3	60·2	60·1	59·9	59·9
2·9	α	Tucanæ		**25**	46·4	46·4	46·3	46·1	45·7	45·3	**S. 60**	22·6	22·5	22·3	22·2	22·0	22·0
2·2	α	Gruis	55	**28**	18·5	18·5	18·4	18·2	17·9	17·6	**S. 47**	04·4	04·3	04·2	04·1	04·0	03·9
3·0	δ	Capricorni		**33**	33·6	33·5	33·4	33·3	33·1	32·8	**S. 16**	13·9	13·9	13·9	13·8	13·7	13·6
2·5	ε	Pegasi	54	**34**	14·3	14·3	14·2	14·0	13·8	13·6	**N. 9**	46·3	46·2	46·2	46·2	46·2	46·3
3·1	β	Aquarii		**37**	24·9	24·9	24·8	24·6	24·4	24·2	**S. 5**	40·3	40·3	40·3	40·3	40·2	40·1
2·6	α	Cephei		**40**	29·9	29·9	29·8	29·5	29·1	28·7	**N. 62**	29·5	29·4	29·2	29·1	29·2	29·3
2·6	ε	Cygni		**48**	41·0	41·0	40·8	40·6	40·4	40·1	**N. 33**	53·2	53·0	53·0	52·9	53·0	53·1
1·3	α	Cygni	53	**49**	50·6	50·5	50·4	50·1	49·8	49·6	**N. 45**	12·0	11·9	11·8	11·7	11·8	11·9
3·2	α	Indi		**50**	61·0	60·9	60·7	60·4	60·1	59·8	**S. 47**	22·3	22·2	22·1	22·0	22·0	22·0
2·1	α	Pavonis	52	**54**	02·9	02·8	02·5	02·2	01·8	01·4	**S. 56**	48·5	48·4	48·3	48·2	48·2	48·2
2·3	γ	Cygni		**54**	39·2	39·2	39·0	38·8	38·5	38·3	**N. 40**	11·1	11·0	10·9	10·8	10·9	11·0
0·9	α	Aquilæ	51	**62**	35·3	35·2	35·0	34·8	34·6	34·4	**N. 8**	48·5	48·4	48·4	48·4	48·5	48·6
2·8	γ	Aquilæ		**63**	42·7	42·6	42·4	42·2	42·0	41·8	**N. 10**	33·5	33·4	33·4	33·4	33·4	33·6
3·0	δ	Cygni		**63**	56·5	56·4	56·2	55·9	55·6	55·4	**N. 45**	04·6	04·4	04·3	04·3	04·4	04·5
3·2	β	Cygni		**67**	33·3	33·2	33·0	32·8	32·6	32·4	**N. 27**	54·7	54·6	54·5	54·5	54·6	54·8
3·0	π	Sagittarii		**72**	54·2	54·1	53·9	53·7	53·4	53·2	**S. 21**	03·6	03·6	03·5	03·5	03·5	03·4
3·0	ζ	Aquilæ		**73**	54·9	54·8	54·6	54·4	54·2	54·0	**N. 13**	49·8	49·7	49·7	49·7	49·7	49·9
2·7	ζ	Sagittarii		**74**	43·0	42·8	42·6	42·3	42·1	41·9	**S. 29**	54·7	54·7	54·7	54·7	54·6	54·6
2·1	σ	Sagittarii	50	**76**	32·6	32·4	32·2	32·0	31·7	31·5	**S. 26**	19·5	19·4	19·4	19·4	19·4	19·4
0·1	α	Lyræ	49	**80**	57·9	57·7	57·5	57·3	57·0	56·9	**N. 38**	45·7	45·6	45·5	45·6	45·7	45·8
2·9	λ	Sagittarii		**83**	21·9	21·7	21·5	21·2	21·0	20·9	**S. 25**	26·0	26·0	26·0	26·0	26·0	26·0
2·0	ε	Sagittarii	48	**84**	20·5	20·3	20·0	19·8	19·5	19·4	**S. 34**	23·7	23·6	23·6	23·6	23·6	23·6
2·8	δ	Sagittarii		**85**	07·3	07·1	06·9	06·7	06·4	06·3	**S. 29**	50·2	50·2	50·2	50·2	50·2	50·2
3·1	γ	Sagittarii		**88**	55·2	55·0	54·8	54·5	54·3	54·1	**S. 30**	25·4	25·4	25·4	25·4	25·4	25·4
2·4	γ	Draconis	47	**90**	59·4	59·2	58·9	58·6	58·3	58·2	**N. 51**	29·5	29·3	29·3	29·3	29·4	29·6
2·9	β	Ophiuchi		**94**	25·1	24·9	24·7	24·5	24·3	24·2	**N. 4**	34·6	34·5	34·5	34·5	34·6	34·7
2·5	κ	Scorpii		**94**	46·7	46·5	46·2	45·9	45·7	45·5	**S. 39**	01·0	01·0	01·0	01·0	01·0	01·1
2·0	θ	Scorpii		**96**	05·2	04·9	04·6	04·3	04·1	03·9	**S. 42**	58·9	58·8	58·8	58·9	58·9	59·0
2·1	α	Ophiuchi	46	**96**	32·2	32·0	31·8	31·6	31·4	31·3	**N. 12**	34·6	34·5	34·5	34·5	34·6	34·7
1·7	λ	Scorpii	45	**96**	59·5	59·2	58·9	58·7	58·5	58·3	**S. 37**	05·1	05·1	05·1	05·1	05·2	05·2
3·0	α	Aræ		**97**	29·3	29·0	28·6	28·3	28·0	27·9	**S. 49**	51·4	51·3	51·3	51·3	51·4	51·5
3·0	β	Draconis		**97**	31·8	31·5	31·2	30·9	30·7	30·6	**N. 52**	19·0	18·9	18·9	18·9	19·0	19·2
2·8	υ	Scorpii		**97**	42·2	41·9	41·6	41·4	41·2	41·0	**S. 37**	16·5	16·5	16·5	16·6	16·6	16·6
2·8	β	Aræ		**99**	09·4	09·1	08·7	08·4	08·1	07·9	**S. 55**	30·3	30·3	30·3	30·3	30·4	30·5
Var.‡	α	Herculis		**101**	36·2	36·0	35·8	35·6	35·4	35·3	**N. 14**	25·0	24·9	24·8	24·9	24·9	25·0
2·6	η	Ophiuchi	44	**102**	44·2	44·0	43·8	43·6	43·4	43·3	**S. 15**	41·7	41·8	41·8	41·8	41·8	41·8
3·1	ζ	Aræ		**105**	49·5	49·1	48·7	48·4	48·1	48·0	**S. 55**	57·1	57·0	57·1	57·1	57·2	57·3
2·4	ε	Scorpii		**107**	50·0	49·7	49·5	49·2	49·1	49·0	**S. 34**	15·0	15·0	15·0	15·1	15·1	15·1
1·9	α	Triang. Aust.	43	**108**	27·0	26·4	25·9	25·4	25·0	24·8	**S. 68**	59·0	58·9	58·9	59·0	59·1	59·2
3·0	ζ	Herculis		**109**	53·9	53·7	53·5	53·3	53·1	53·1	**N. 31**	38·6	38·5	38·4	38·5	38·6	38·7
2·7	ζ	Ophiuchi		**111**	01·7	01·5	01·3	01·1	00·9	00·8	**S. 10**	31·2	31·3	31·3	31·3	31·3	31·3
2·9	τ	Scorpii		**111**	23·3	23·1	22·8	22·6	22·5	22·4	**S. 28**	10·0	10·0	10·1	10·1	10·1	10·2
2·8	β	Herculis		**112**	41·7	41·5	41·2	41·1	40·9	40·9	**N. 21**	32·3	32·2	32·2	32·2	32·3	32·4
1·2	α	Scorpii	42	**112**	60·1	59·9	59·6	59·4	59·3	59·2	**S. 26**	22·8	22·8	22·8	22·9	22·9	22·9
2·9	η	Draconis		**114**	05·4	05·1	04·7	04·4	04·2	04·2	**N. 61**	33·8	33·7	33·7	33·8	33·9	34·1
3·0	δ	Ophiuchi		**116**	43·0	42·7	42·5	42·3	42·2	42·2	**S. 3**	38·1	38·2	38·2	38·2	38·2	38·1
2·8	β	Scorpii		**118**	58·6	58·3	58·1	57·9	57·8	57·7	**S. 19**	44·5	44·5	44·6	44·6	44·6	44·6
2·5	δ	Scorpii		**120**	15·4	15·2	15·0	14·8	14·6	14·6	**S. 22**	33·3	33·4	33·4	33·4	33·5	33·5
3·0	π	Scorpii		**120**	38·1	37·9	37·6	37·4	37·3	37·3	**S. 26**	02·8	02·8	02·9	02·9	03·0	03·0
3·0	β	Trianguli Aust.		**121**	43·5	43·0	42·6	42·2	41·9	41·9	**S. 63**	21·4	21·4	21·4	21·5	21·7	21·8
2·8	α	Serpentis		**124**	13·0	12·8	12·6	12·4	12·3	12·3	**N. 6**	29·8	29·7	29·7	29·7	29·8	29·9
2·3	α	Coronæ Bor.	41	**126**	34·4	34·2	33·9	33·8	33·7	33·7	**N. 26**	47·4	47·3	47·3	47·3	47·4	47·6
3·0	γ	Lupi †		**126**	35·9	35·6	35·3	35·1	35·0	34·9	**S. 41**	05·2	05·3	05·3	05·4	05·5	05·6

‡ 3·0—3·7

† Not suitable for use with H.O. 214 (H.D. 486)

Mag.	Name and Number		S.H.A.							Dec.						
				JULY	AUG.	SEPT.	OCT.	NOV.	DEC.		JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
			°	′	′	′	′	′	′	°	′	′	′	′	′	′
3·4	γ Cephei †		**5**	22·4	21·8	21·6	21·7	22·1	22·8	**N. 77**	30·2	30·4	30·5	30·7	30·9	30·9
2·6	*Markab*	57	**14**	05·1	04·9	04·8	04·9	04·9	05·0	**N. 15**	05·1	05·2	05·3	05·4	05·4	05·3
2·6	*Scheat*		**14**	19·4	19·2	19·1	19·2	19·3	19·4	**N. 27**	57·6	57·8	57·9	58·0	58·0	58·0
1·3	*Fomalhaut*	56	**15**	53·6	53·4	53·3	53·4	53·5	53·6	**S. 29**	44·2	44·2	44·3	44·4	44·4	44·5
2·2	β Gruis		**19**	39·7	39·5	39·5	39·5	39·7	39·9	**S. 46**	59·8	59·9	60·0	60·1	60·2	60·2
2·9	α Tucanæ		**25**	45·0	44·7	44·7	44·9	45·1	45·4	**S. 60**	22·0	22·1	22·2	22·3	22·4	22·4
2·2	*Al Na'ir*	55	**28**	17·3	17·1	17·1	17·2	17·4	17·5	**S. 47**	03·9	04·0	04·1	04·2	04·2	04·2
3·0	δ Capricorni		**33**	32·6	32·5	32·5	32·6	32·7	32·8	**S. 16**	13·6	13·5	13·6	13·6	13·6	13·6
2·5	*Enif*	54	**34**	13·4	13·3	13·3	13·4	13·5	13·6	**N. 9**	46·4	46·5	46·6	46·6	46·6	46·6
3·1	β Aquarii		**37**	24·0	23·9	23·9	24·0	24·1	24·2	**S. 5**	40·0	40·0	40·0	40·0	40·0	40·0
2·6	*Alderamin*		**40**	28·4	28·4	28·5	28·7	29·1	29·4	**N. 62**	29·4	29·6	29·8	29·9	29·9	29·9
2·6	ε Cygni		**48**	40·0	39·9	40·0	40·1	40·3	40·4	**N. 33**	53·2	53·4	53·5	53·6	53·6	53·5
1·3	*Deneb*	53	**49**	49·4	49·4	49·5	49·6	49·9	50·0	**N. 45**	12·1	12·2	12·4	12·5	12·5	12·4
3·2	α Indi		**50**	59·6	59·5	59·6	59·8	59·9	60·1	**S. 47**	22·0	22·1	22·2	22·2	22·2	22·2
2·1	*Peacock*	52	**54**	01·2	01·1	01·2	01·4	01·7	01·8	**S. 56**	48·3	48·4	48·5	48·5	48·5	48·5
2·3	γ Cygni		**54**	38·1	38·1	38·2	38·4	38·6	38·7	**N. 40**	11·2	11·3	11·5	11·5	11·5	11·4
0·9	*Altair*	51	**62**	34·3	34·2	34·3	34·4	34·6	34·6	**N. 8**	48·7	48·8	48·8	48·8	48·8	48·7
2·8	γ Aquilæ		**63**	41·7	41·7	41·8	41·9	42·0	42·1	**N. 10**	33·7	33·7	33·8	33·8	33·8	33·7
3·0	δ Cygni		**63**	55·3	55·3	55·5	55·7	55·9	56·0	**N. 45**	04·7	04·8	05·0	05·0	05·0	04·9
3·2	*Albireo*		**67**	32·3	32·3	32·4	32·6	32·7	32·8	**N. 27**	54·9	55·0	55·1	55·1	55·1	55·0
3·0	π Sagittarii		**72**	53·1	53·1	53·2	53·4	53·5	53·5	**S. 21**	03·4	03·4	03·5	03·5	03·5	03·5
3·0	ζ Aquilæ		**73**	53·9	53·9	54·0	54·2	54·3	54·3	**N. 13**	50·0	50·1	50·1	50·1	50·1	50·0
2·7	ζ Sagittarii		**74**	41·8	41·8	41·9	42·0	42·2	42·2	**S. 29**	54·6	54·7	54·7	54·7	54·7	54·7
2·1	*Nunki*	50	**76**	31·4	31·4	31·6	31·7	31·8	31·8	**S. 26**	19·4	19·4	19·4	19·4	19·4	19·4
0·1	*Vega*	49	**80**	56·8	56·9	57·1	57·3	57·4	57·5	**N. 38**	46·0	46·1	46·2	46·2	46·1	46·0
2·9	λ Sagittarii		**83**	20·8	20·8	20·9	21·1	21·2	21·2	**S. 25**	26·0	26·0	26·0	26·0	26·0	26·0
2·0	*Kaus Australis*	48	**84**	19·3	19·3	19·4	19·6	19·7	19·7	**S. 34**	23·7	23·7	23·7	23·7	23·7	23·7
2·8	δ Sagittarii		**85**	06·2	06·2	06·3	06·5	06·6	06·6	**S. 29**	50·2	50·2	50·2	50·2	50·2	50·2
3·1	γ Sagittarii		**88**	54·1	54·1	54·2	54·4	54·5	54·5	**S. 30**	25·4	25·4	25·4	25·4	25·4	25·4
2·4	*Eltanin*	47	**90**	58·2	58·4	58·6	58·9	59·1	59·1	**N. 51**	29·7	29·9	29·9	29·9	29·8	29·7
2·9	β Ophiuchi		**94**	24·2	24·2	24·4	24·5	24·6	24·6	**N. 4**	34·7	34·8	34·8	34·8	34·8	34·7
2·5	κ Scorpii		**94**	45·5	45·6	45·7	45·9	46·0	46·0	**S. 39**	01·1	01·1	01·2	01·1	01·1	01·0
2·0	θ Scorpii		**96**	03·9	04·0	04·1	04·3	04·4	04·4	**S. 42**	59·0	59·1	59·1	59·1	59·0	58·9
2·1	*Rasalhague*	46	**96**	31·3	31·3	31·5	31·6	31·7	31·7	**N. 12**	34·8	34·8	34·8	34·8	34·8	34·7
1·7	*Shaula*	45	**96**	58·3	58·3	58·5	58·7	58·7	58·7	**S. 37**	05·2	05·3	05·3	05·3	05·2	05·2
3·0	α Aræ		**97**	27·8	27·9	28·1	28·3	28·4	28·4	**S. 49**	51·5	51·6	51·6	51·6	51·5	51·4
3·0	β Draconis		**97**	30·7	30·8	31·1	31·3	31·5	31·6	**N. 52**	19·4	19·5	19·5	19·5	19·4	19·2
2·8	υ Scorpii		**97**	41·0	41·0	41·2	41·4	41·4	41·4	**S. 37**	16·7	16·7	16·7	16·7	16·7	16·6
2·8	β Aræ		**99**	07·9	08·0	08·2	08·4	08·6	08·5	**S. 55**	30·6	30·7	30·7	30·6	30·6	30·5
Var.‡	α Herculis		**101**	35·3	35·4	35·5	35·7	35·7	35·7	**N. 14**	25·1	25·2	25·2	25·2	25·1	25·0
2·6	*Sabik*	44	**102**	43·3	43·3	43·5	43·6	43·7	43·6	**S. 15**	41·8	41·7	41·7	41·7	41·7	41·7
3·1	ζ Aræ		**105**	48·0	48·1	48·4	48·6	48·7	48·6	**S. 55**	57·4	57·4	57·5	57·4	57·3	57·2
2·4	ε Scorpii		**107**	48·9	49·0	49·2	49·3	49·4	49·3	**S. 34**	15·2	15·2	15·2	15·2	15·1	15·1
1·9	*Atria*	43	**108**	24·8	25·1	25·5	25·9	26·0	25·9	**S. 68**	59·4	59·4	59·4	59·4	59·3	59·1
3·0	ζ Herculis		**109**	53·1	53·2	53·4	53·5	53·6	53·6	**N. 31**	38·9	38·9	38·9	38·9	38·8	38·6
2·7	ζ Ophiuchi		**111**	00·8	00·9	01·1	01·2	01·2	01·1	**S. 10**	31·2	31·2	31·2	31·2	31·2	31·2
2·9	τ Scorpii		**111**	22·4	22·4	22·6	22·7	22·8	22·7	**S. 28**	10·2	10·2	10·2	10·1	10·1	10·1
2·8	β Herculis		**112**	40·9	41·0	41·1	41·3	41·3	41·3	**N. 21**	32·5	32·6	32·6	32·5	32·5	32·3
1·2	*Antares*	42	**112**	59·2	59·3	59·4	59·5	59·6	59·5	**S. 26**	22·9	22·9	22·9	22·9	22·9	22·9
2·9	η Draconis		**114**	04·4	04·6	05·0	05·3	05·5	05·5	**N. 61**	34·2	34·3	34·3	34·2	34·1	33·9
3·0	δ Ophiuchi		**116**	42·2	42·3	42·4	42·5	42·5	42·4	**S. 3**	38·1	38·1	38·1	38·1	38·1	38·2
2·8	β Scorpii		**118**	57·7	57·8	57·9	58·1	58·1	58·0	**S. 19**	44·6	44·6	44·6	44·6	44·6	44·6
2·5	*Dschubba*		**120**	14·6	14·7	14·8	14·9	15·0	14·9	**S. 22**	33·5	33·5	33·4	33·4	33·4	33·4
3·0	π Scorpii		**120**	37·3	37·4	37·5	37·6	37·6	37·5	**S. 26**	03·0	03·0	03·0	02·9	02·9	02·9
3·0	β Trianguli Aust.		**121**	42·0	42·2	42·5	42·8	42·8	42·6	**S. 63**	21·9	21·9	21·9	21·8	21·7	21·6
2·8	α Serpentis		**124**	12·3	12·4	12·6	12·7	12·7	12·6	**N. 6**	29·9	29·9	30·0	29·9	29·9	29·8
2·3	*Alphecca*	41	**126**	33·7	33·9	34·0	34·1	34·1	34·0	**N. 26**	47·6	47·7	47·7	47·6	47·5	47·3
3·0	γ Lupi †		**126**	35·0	35·1	35·3	35·4	35·4	35·3	**S. 41**	05·6	05·6	05·6	05·5	05·4	05·4

‡ 3·0—3·7

†Not suitable for use with H.O. 214 (H.D. 486)

Mag.	Name and Number	S.H.A.							Dec.						
			JAN.	FEB.	MAR.	APR.	MAY	JUNE		JAN.	FEB.	MAR.	APR.	MAY	JUNE
3·1	γ Ursæ Minoris †	**129**	49·5	48·9	48·4	48·1	48·0	48·1	**N. 71**	54·7	54·6	54·7	54·8	55·0	55·1
3·1	γ Trianguli Aust.	**130**	48·7	48·2	47·7	47·3	47·1	47·1	**S. 68**	35·4	35·5	35·6	35·7	35·8	36·0
2·7	β Libræ	**131**	03·5	03·2	03·0	02·9	02·8	02·7	**S. 9**	17·9	18·0	18·0	18·0	18·0	18·0
2·8	β Lupi	**135**	44·6	44·3	44·0	43·8	43·7	43·7	**S. 43**	02·3	02·4	02·5	02·6	02·7	02·7
2·2	β Ursæ Minoris 40	**137**	19·5	18·8	18·3	17·9	17·9	18·1	**N. 74**	14·7	14·6	14·7	14·8	15·0	15·1
2·9	α Libræ 39	**137**	35·9	35·6	35·4	35·3	35·2	35·2	**S. 15**	56·7	56·8	56·9	56·9	56·9	56·9
2·6	ε Bootis	**138**	60·3	60·1	59·9	59·7	59·7	59·7	**N. 27**	10·1	10·0	10·0	10·1	10·2	10·3
2·9	α Lupi	**139**	53·9	53·6	53·3	53·1	53·1	53·1	**S. 47**	17·2	17·3	17·4	17·5	17·6	17·7
0·1	α Centauri 38	**140**	29·2	28·8	28·5	28·2	28·2	28·2	**S. 60**	44·1	44·2	44·3	44·4	44·6	44·7
2·6	η Centauri	**141**	29·2	28·9	28·7	28·5	28·4	28·4	**S. 42**	03·3	03·3	03·4	03·5	03·6	03·7
3·0	γ Bootis	**142**	12·8	12·5	12·3	12·2	12·1	12·2	**N. 38**	24·3	24·2	24·2	24·3	24·5	24·6
0·2	α Bootis 37	**146**	20·8	20·5	20·4	20·3	20·2	20·3	**N. 19**	17·9	17·9	17·9	17·9	18·0	18·1
2·3	θ Centauri 36	**148**	39·9	39·7	39·4	39·3	39·3	39·3	**S. 36**	15·3	15·4	15·5	15·6	15·7	15·7
0·9	β Centauri 35	**149**	26·8	26·4	26·1	25·9	25·9	25·9	**S. 60**	15·5	15·6	15·7	15·9	16·0	16·1
3·1	ζ Centauri	**151**	28·3	27·9	27·7	27·6	27·5	27·6	**S. 47**	10·3	10·4	10·5	10·7	10·8	10·9
2·8	η Bootis	**151**	36·1	35·9	35·7	35·6	35·6	35·6	**N. 18**	30·6	30·5	30·5	30·6	30·6	30·7
1·9	η Ursæ Majoris 34	**153**	20·5	20·2	20·0	19·9	19·9	20·0	**N. 49**	25·4	25·3	25·4	25·5	25·7	25·8
2·6	ε Centauri †	**155**	23·3	23·0	22·7	22·6	22·6	22·7	**S. 53**	20·8	20·9	21·0	21·1	21·3	21·3
1·2	α Virginis 33	**158**	60·1	59·9	59·7	59·7	59·6	59·7	**S. 11**	02·5	02·6	02·7	02·7	02·7	02·7
2·2	ζ Ursæ Majoris	**159**	15·0	14·7	14·5	14·4	14·4	14·6	**N. 55**	02·4	02·4	02·4	02·6	02·7	02·8
2·9	ι Centauri	**160**	10·2	10·0	09·8	09·7	09·7	09·8	**S. 36**	35·4	35·5	35·6	35·7	35·8	35·8
3·0	ε Virginis	**164**	44·4	44·1	44·0	43·9	44·0	44·0	**N. 11**	04·8	04·7	04·7	04·7	04·8	04·9
2·9	α Canum Venat.	**166**	15·6	15·3	15·2	15·1	15·2	15·3	**N. 38**	26·2	26·2	26·3	26·4	26·5	26·6
1·7	ε Ursæ Majoris 32	**166**	44·6	44·3	44·1	44·1	44·2	44·3	**N. 56**	04·7	04·7	04·8	05·0	05·1	05·2
1·5	β Crucis	**168**	23·9	23·6	23·4	23·3	23·4	23·5	**S. 59**	33·6	33·7	33·9	34·0	34·2	34·2
2·9	γ Virginis	**169**	52·4	52·2	52·0	52·0	52·0	52·1	**S. 1**	19·5	19·6	19·6	19·6	19·6	19·6
2·4	γ Centauri	**169**	55·9	55·7	55·5	55·4	55·5	55·6	**S. 48**	49·9	50·0	50·1	50·3	50·4	50·4
2·9	α Muscæ	**171**	02·3	01·8	01·6	01·5	01·6	01·9	**S. 69**	00·3	00·4	00·6	00·8	00·9	01·0
2·8	β Corvi	**171**	42·0	41·8	41·7	41·7	41·7	41·8	**S. 23**	16·2	16·3	16·4	16·5	16·5	16·5
1·6	γ Crucis 31	**172**	31·2	30·9	30·7	30·7	30·8	30·9	**S. 56**	58·9	59·0	59·2	59·3	59·5	59·5
1·1	α Crucis 30	**173**	39·6	39·3	39·1	39·1	39·2	39·4	**S. 62**	58·1	58·3	58·4	58·6	58·7	58·8
2·8	γ Corvi 29	**176**	20·4	20·2	20·1	20·0	20·1	20·2	**S. 17**	24·9	25·0	25·1	25·1	25·2	25·2
2·9	δ Centauri	**178**	12·1	11·8	11·7	11·7	11·8	11·9	**S. 50**	35·5	35·7	35·8	36·0	36·1	36·1
2·5	γ Ursæ Majoris	**181**	50·4	50·1	50·0	50·0	50·1	50·3	**N. 53**	49·0	49·0	49·1	49·3	49·4	49·4
2·2	β Leonis 28	**183**	01·4	01·2	01·1	01·1	01·2	01·3	**N. 14**	41·8	41·8	41·8	41·8	41·9	41·9
2·6	δ Leonis	**191**	46·4	46·2	46·1	46·2	46·2	46·3	**N. 20**	38·7	38·7	38·7	38·8	38·8	38·9
3·2	ψ Ursæ Majoris	**192**	54·0	53·8	53·8	53·8	53·9	54·1	**N. 44**	37·1	37·1	37·2	37·3	37·4	37·4
2·0	α Ursæ Majoris 27	**194**	24·8	24·5	24·4	24·6	24·8	25·1	**N. 61**	52·2	52·2	52·3	52·5	52·6	52·6
2·4	δ Ursæ Majoris	**194**	52·7	52·4	52·4	52·5	52·7	52·9	**N. 56**	30·0	30·1	30·2	30·3	30·4	30·4
2·8	μ Velorum	**198**	32·7	32·5	32·5	32·6	32·8	32·9	**S. 49**	17·9	18·0	18·2	18·3	18·4	18·4
3·0	θ Carinæ †	**199**	27·1	26·9	26·9	27·0	27·3	27·6	**S. 64**	16·3	16·5	16·7	16·9	16·9	17·0
2·3	γ Leonis	**205**	19·0	18·9	18·8	18·9	19·0	19·1	**N. 19**	57·2	57·2	57·2	57·3	57·3	57·4
1·3	α Leonis 26	**208**	12·4	12·2	12·2	12·3	12·4	12·5	**N. 12**	04·6	04·5	04·5	04·6	04·6	04·6
3·1	ε Leonis	**213**	51·3	51·2	51·2	51·3	51·4	51·5	**N. 23**	52·6	52·6	52·6	52·7	52·7	52·7
3·0	N Velorum	**217**	21·4	21·3	21·4	21·6	21·8	22·1	**S. 56**	56·0	56·2	56·3	56·5	56·5	56·4
2·2	α Hydræ 25	**218**	22·7	22·6	22·6	22·7	22·8	22·9	**S. 8**	33·7	33·8	33·8	33·9	33·8	33·8
2·6	κ Velorum	**219**	38·2	38·1	38·2	38·4	38·7	38·9	**S. 54**	54·8	55·0	55·1	55·2	55·2	55·2
2·2	ι Carinæ	**220**	52·0	52·0	52·1	52·3	52·6	52·8	**S. 59**	10·8	10·9	11·1	11·2	11·2	11·2
1·8	β Carinæ 24	**221**	44·5	44·4	44·6	45·0	45·4	45·8	**S. 69**	37·4	37·6	37·7	37·9	37·9	37·8
2·2	λ Velorum 23	**223**	12·1	12·1	12·1	12·3	12·5	12·6	**S. 43**	20·4	20·6	20·8	20·8	20·8	20·8
3·1	ι Ursæ Majoris	**225**	34·8	34·7	34·8	35·0	35·1	35·3	**N. 48**	07·7	07·8	07·9	07·9	07·9	07·9
2·0	δ Velorum	**228**	58·2	58·2	58·3	58·5	58·8	59·0	**S. 54**	37·5	37·7	37·8	37·9	37·9	37·9
1·7	ε Carinæ 22	**234**	28·5	28·5	28·7	29·0	29·3	29·5	**S. 59**	26·2	26·4	26·6	26·6	26·6	26·5
1·9	γ Velorum	**237**	47·0	47·0	47·1	47·3	47·5	47·7	**S. 47**	16·3	16·4	16·5	16·6	16·6	16·5
2·9	ρ Puppis	**238**	21·0	21·0	21·1	21·2	21·4	21·4	**S. 24**	14·4	14·5	14·6	14·7	14·6	14·6
2·3	ζ Puppis	**239**	17·8	17·8	17·9	18·1	18·2	18·4	**S. 39**	56·4	56·6	56·7	56·7	56·7	56·6
1·2	β Geminorum 21	**244**	00·8	00·8	00·9	01·0	01·1	01·2	**N. 28**	04·8	04·8	04·8	04·8	04·8	04·8
0·5	α Canis Minoris 20	**245**	28·0	28·0	28·1	28·2	28·3	28·4	**N. 5**	16·9	16·8	16·8	16·8	16·8	16·9

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Mag.	Name and Number		S.H.A.							Dec.						
				JULY	AUG.	SEPT.	OCT.	NOV.	DEC.		JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
			°	′	′	′	′	′	′	°	′	′	′	′	′	′
3·1	γ Ursæ Minoris †		**129**	48·5	49·0	49·5	49·9	50·1	50·0	**N. 71**	55·2	55·2	55·2	55·1	54·9	54·7
3·1	γ Trianguli Aust.		**130**	47·3	47·6	48·0	48·2	48·2	48·0	**S. 68**	36·0	36·1	36·0	35·9	35·8	35·7
2·7	β Libræ		**131**	02·8	02·9	03·0	03·1	03·1	03·0	**S. 9**	18·0	17·9	17·9	17·9	17·9	18·0
2·8	β Lupi		**135**	43·8	43·9	44·1	44·2	44·2	44·0	**S. 43**	02·8	02·8	02·7	02·6	02·6	02·5
2·2	*Kochab*	40	**137**	18·6	19·2	19·8	20·2	20·3	20·1	**N. 74**	15·2	15·2	15·1	15·0	14·8	14·6
2·9	*Zubenelgenubi*	39	**137**	35·2	35·4	35·5	35·5	35·5	35·4	**S. 15**	56·9	56·9	56·9	56·8	56·8	56·9
2·6	ε Bootis		**138**	59·8	59·9	60·0	60·1	60·1	60·0	**N. 27**	10·4	10·4	10·3	10·3	10·1	10·0
2·9	α Lupi		**139**	53·2	53·3	53·5	53·6	53·5	53·3	**S. 47**	17·7	17·7	17·6	17·5	17·4	17·4
0·1	*RigilKent.*	38	**140**	28·4	28·7	28·9	29·1	29·0	28·7	**S. 60**	44·7	44·7	44·6	44·5	44·4	44·3
2·6	η Centauri		**141**	28·5	28·7	28·8	28·9	28·8	28·7	**S. 42**	03·7	03·7	03·6	03·6	03·5	03·5
3·0	γ Bootis		**142**	12·3	12·5	12·6	12·7	12·7	12·5	**N. 38**	24·7	24·7	24·6	24·5	24·4	24·2
0·2	*Arcturus*	37	**146**	20·3	20·5	20·6	20·6	20·6	20·4	**N. 19**	18·1	18·1	18·1	18·0	17·9	17·8
2·3	*Menkent*	36	**148**	39·4	39·5	39·7	39·7	39·6	39·4	**S. 36**	15·7	15·7	15·6	15·5	15·5	15·5
0·9	*Hadar*	35	**149**	26·1	26·4	26·6	26·7	26·6	26·3	**S. 60**	16·1	16·1	16·0	15·9	15·8	15·7
3·1	ζ Centauri		**151**	27·7	27·9	28·0	28·1	28·0	27·7	**S. 47**	10·9	10·8	10·8	10·7	10·6	10·5
2·8	η Bootis		**151**	35·7	35·8	35·9	35·9	35·9	35·7	**N. 18**	30·8	30·8	30·8	30·7	30·6	30·4
1·9	*Alkaid*	34	**153**	20·2	20·4	20·5	20·6	20·5	20·3	**N. 49**	25·8	25·8	25·7	25·6	25·4	25·2
2·6	ε Centauri †		**155**	22·8	23·0	23·2	23·2	23·1	22·8	**S. 53**	21·4	21·3	21·2	21·1	21·0	21·0
1·2	*Spica*	33	**158**	59·8	59·9	59·9	59·9	59·8	59·6	**S. 11**	02·7	02·6	02·6	02·6	02·6	02·7
2·2	*Mizar*		**159**	14·8	15·0	15·2	15·2	15·1	14·9	**N. 55**	02·9	02·8	02·7	02·6	02·4	02·2
2·9	ι Centauri		**160**	09·9	10·0	10·1	10·1	10·0	09·7	**S. 36**	35·8	35·8	35·7	35·6	35·5	35·6
3·0	ε Virginis		**164**	44·1	44·2	44·3	44·3	44·1	43·9	**N. 11**	04·9	04·9	04·9	04·8	04·7	04·6
2·9	*Cor Caroli*		**166**	15·4	15·5	15·6	15·6	15·5	15·3	**N. 38**	26·6	26·6	26·5	26·4	26·2	26·1
1·7	*Alioth*	32	**166**	44·6	44·8	44·9	44·9	44·8	44·5	**N. 56**	05·2	05·1	05·0	04·8	04·7	04·5
1·5	*Mimosa*		**168**	23·8	24·0	24·1	24·1	23·9	23·5	**S. 59**	34·2	34·2	34·1	33·9	33·8	33·8
2·9	γ Virginis		**169**	52·2	52·2	52·3	52·3	52·1	51·9	**S. 1**	19·6	19·5	19·5	19·5	19·6	19·7
2·4	*Muhlifain*		**169**	55·8	55·9	56·0	56·0	55·8	55·5	**S. 48**	50·4	50·4	50·2	50·1	50·1	50·1
2·9	α Muscæ		**171**	02·3	02·6	02·8	02·8	02·5	02·0	**S. 69**	01·0	01·0	00·8	00·7	00·6	00·5
2·8	β Corvi		**171**	41·9	41·9	42·0	42·0	41·8	41·6	**S. 23**	16·5	16·4	16·3	16·3	16·3	16·4
1·6	*Gacrux*	31	**172**	31·1	31·3	31·5	31·4	31·2	30·8	**S. 56**	59·5	59·4	59·3	59·2	59·1	59·1
1·1	*Acrux*	30	**173**	39·6	39·9	40·0	40·0	39·7	39·3	**S. 62**	58·8	58·7	58·6	58·4	58·3	58·3
2·8	*Gienah*	29	**176**	20·2	20·3	20·4	20·3	20·2	19·9	**S. 17**	25·1	25·1	25·0	25·0	25·0	25·1
2·9	δ Centauri		**178**	12·1	12·2	12·3	12·2	12·0	11·7	**S. 50**	36·1	36·0	35·9	35·8	35·7	35·7
2·5	*Phecda*		**181**	50·5	50·6	50·7	50·6	50·4	50·1	**N. 53**	49·4	49·3	49·2	49·0	48·9	48·7
2·2	*Denebola*	28	**183**	01·4	01·4	01·4	01·4	01·2	01·0	**N. 14**	41·9	41·9	41·9	41·8	41·7	41·6
2·6	δ Leonis		**191**	46·4	46·5	46·5	46·4	46·2	45·9	**N. 20**	38·9	38·9	38·8	38·7	38·6	38·5
3·2	ψ Ursæ Majoris		**192**	54·2	54·3	54·3	54·2	53·9	53·6	**N. 44**	37·4	37·3	37·2	37·1	36·9	36·8
2·0	*Dubhe*	27	**194**	25·3	25·4	25·4	25·2	24·9	24·5	**N. 61**	52·5	52·4	52·3	52·1	51·9	51·9
2·4	*Merak*		**194**	53·0	53·1	53·1	53·0	52·7	52·3	**N. 56**	30·4	30·3	30·1	30·0	29·8	29·7
2·8	μ Velorum		**198**	33·1	33·2	33·2	33·0	32·7	32·4	**S. 49**	18·3	18·2	18·1	18·0	17·9	18·0
3·0	θ Carinæ †		**199**	27·9	28·0	28·0	27·8	27·4	27·0	**S. 64**	16·9	16·8	16·6	16·5	16·4	16·5
2·3	*Algeiba*		**205**	19·2	19·2	19·1	19·0	18·8	18·5	**N. 19**	57·4	57·3	57·3	57·2	57·1	57·0
1·3	*Regulus*	26	**208**	12·5	12·5	12·5	12·3	12·1	11·9	**N. 12**	04·6	04·6	04·6	04·6	04·5	04·4
3·1	ε Leonis		**213**	51·6	51·5	51·5	51·3	51·1	50·8	**N. 23**	52·7	52·7	52·6	52·5	52·4	52·4
3·0	*N* Velorum		**217**	22·2	22·2	22·1	21·9	21·5	21·2	**S. 56**	56·3	56·2	56·0	56·0	56·0	56·1
2·2	*Alphard*	25	**218**	22·9	22·9	22·8	22·7	22·4	22·2	**S. 8**	33·7	33·7	33·6	33·6	33·7	33·8
2·6	κ Velorum		**219**	39·0	39·0	38·9	38·7	38·3	38·0	**S. 54**	55·1	54·9	54·8	54·7	54·7	54·8
2·2	ι Carinæ		**220**	53·0	53·0	52·9	52·6	52·2	51·9	**S. 59**	11·1	10·9	10·8	10·7	10·7	10·8
1·8	*Miaplacidus*	24	**221**	46·1	46·2	46·0	45·6	45·1	44·6	**S. 69**	37·7	37·6	37·4	37·3	37·3	37·4
2·2	*Suhail*	23	**223**	12·7	12·7	12·6	12·4	12·1	11·8	**S. 43**	20·7	20·5	20·4	20·4	20·4	20·5
3·1	ι Ursæ Majoris		**225**	35·3	35·2	35·1	34·8	34·5	34·2	**N. 48**	07·8	07·7	07·6	07·5	07·5	07·4
2·0	δ Velorum		**228**	59·1	59·1	58·9	58·7	58·3	58·0	**S. 54**	37·7	37·6	37·5	37·4	37·4	37·5
1·7	*Avior*	22	**234**	29·6	29·6	29·4	29·1	28·7	28·4	**S. 59**	26·4	26·2	26·1	26·1	26·1	26·2
1·9	γ Velorum		**237**	47·7	47·7	47·5	47·2	46·9	46·7	**S. 47**	16·4	16·2	16·1	16·1	16·1	16·2
2·9	ρ Puppis		**238**	21·4	21·4	21·2	21·0	20·8	20·6	**S. 24**	14·5	14·3	14·3	14·3	14·3	14·4
2·3	ζ Puppis		**239**	18·4	18·3	18·2	17·9	17·6	17·4	**S. 39**	56·5	56·4	56·3	56·2	56·3	56·4
1·2	*Pollux*	21	**244**	01·2	01·0	00·8	00·6	00·4	00·1	**N. 28**	04·8	04·8	04·7	04·7	04·6	04·6
0·5	*Procyon*	20	**245**	28·3	28·2	28·1	27·9	27·6	27·4	**N. 5**	16·9	16·9	17·0	16·9	16·9	16·8

† Not suitable for use with H.O. 214 (H.D. 486)

Mag.	Name and Number		S.H.A.							Dec.						
				JAN.	FEB.	MAR.	APR.	MAY	JUNE		JAN.	FEB.	MAR.	APR.	MAY	JUNE
				′	′	′	′	′	′		′	′	′	′	′	′
1·6	α Geminorum		**246**	42·4	42·4	42·5	42·7	42·8	42·8	**N. 31**	56·2	56·2	56·3	56·3	56·3	56·3
3·3	σ Puppis		**247**	51·9	51·9	52·1	52·3	52·5	52·6	**S. 43**	15·5	15·6	15·7	15·7	15·7	15·6
3·1	β Canis Minoris		**248**	30·9	30·9	31·0	31·2	31·3	31·3	**N. 8**	20·0	20·0	19·9	20·0	20·0	20·0
2·4	η Canis Majoris		**249**	11·7	11·7	11·8	12·0	12·1	12·2	**S. 29**	15·7	15·8	15·9	15·9	15·8	15·7
2·7	π Puppis		**250**	54·5	54·5	54·7	54·9	55·0	55·1	**S. 37**	03·5	03·7	03·8	03·8	03·7	03·6
2·0	δ Canis Majoris		**253**	07·6	07·7	07·8	08·0	08·1	08·2	**S. 26**	21·6	21·7	21·8	21·8	21·7	21·6
3·1	ο Canis Majoris		**254**	28·5	28·6	28·7	28·8	29·0	29·0	**S. 23**	48·2	48·3	48·3	48·3	48·3	48·2
1·6	ε Canis Majoris	19	**255**	33·7	33·7	33·8	34·0	34·1	34·2	**S. 28**	56·6	56·7	56·8	56·8	56·8	56·7
2·8	τ Puppis		**257**	38·9	39·0	39·2	39·5	39·7	39·8	**S. 50**	35·4	35·6	35·7	35·7	35·6	35·5
−1·6	α Canis Majoris	18	**258**	57·5	57·6	57·7	57·8	58·0	58·0	**S. 16**	41·3	41·4	41·4	41·4	41·4	41·3
1·9	γ Geminorum		**260**	53·7	53·8	53·9	54·0	54·1	54·1	**N. 16**	25·0	25·0	25·0	25·0	25·0	25·0
−0·9	α Carinæ	17	**264**	07·8	07·9	08·1	08·4	08·6	08·7	**S. 52**	41·2	41·4	41·4	41·4	41·3	41·2
2·0	β Canis Majoris		**264**	34·2	34·3	34·4	34·6	34·7	34·7	**S. 17**	56·9	56·9	57·0	57·0	56·9	56·8
2·7	θ Aurigæ		**270**	27·1	27·2	27·3	27·5	27·6	27·6	**N. 37**	12·6	12·7	12·7	12·7	12·6	12·6
2·1	β Aurigæ		**270**	31·7	31·8	31·9	32·1	32·3	32·2	**N. 44**	56·7	56·8	56·8	56·8	56·7	56·7
Var.‡	α Orionis	16	**271**	30·6	30·7	30·8	30·9	31·0	31·0	**N. 7**	24·1	24·0	24·0	24·0	24·0	24·1
2·2	κ Orionis		**273**	19·6	19·6	19·8	19·9	20·0	20·0	**S. 9**	40·8	40·9	40·9	40·9	40·9	40·8
1·9	ζ Orionis		**275**	05·6	05·6	05·8	05·9	06·0	06·0	**S. 1**	57·4	57·5	57·5	57·5	57·4	57·4
2·8	α Columbæ		**275**	17·3	17·4	17·6	17·8	17·9	17·9	**S. 34**	05·4	05·5	05·5	05·5	05·4	05·3
3·0	ζ Tauri		**275**	55·4	55·5	55·6	55·8	55·9	55·8	**N. 21**	07·7	07·7	07·7	07·7	07·6	07·6
1·8	ε Orionis	15	**276**	13·9	13·9	14·0	14·2	14·3	14·2	**S. 1**	13·1	13·2	13·2	13·2	13·1	13·1
2·9	ι Orionis		**276**	24·9	25·0	25·1	25·3	25·4	25·3	**S. 5**	55·6	55·7	55·7	55·7	55·7	55·6
2·7	α Leporis		**277**	03·8	03·9	04·1	04·2	04·3	04·3	**S. 17**	50·5	50·6	50·6	50·6	50·5	50·4
2·5	δ Orionis		**277**	17·1	17·2	17·3	17·4	17·5	17·5	**S. 0**	19·1	19·1	19·2	19·1	19·1	19·0
3·0	β Leporis		**278**	10·7	10·8	10·9	11·1	11·1	11·1	**S. 20**	46·9	46·9	47·0	46·9	46·9	46·8
1·8	β Tauri	14	**278**	46·9	47·0	47·1	47·3	47·3	47·3	**N. 28**	35·3	35·3	35·3	35·3	35·2	35·2
1·7	γ Orionis	13	**279**	01·1	01·2	01·3	01·4	01·5	01·4	**N. 6**	19·6	19·6	19·6	19·6	19·6	19·7
0·2	α Aurigæ	12	**281**	14·5	14·6	14·8	15·0	15·1	15·0	**N. 45**	58·5	58·6	58·6	58·6	58·5	58·4
0·3	β Orionis	11	**281**	38·1	38·2	38·3	38·4	38·5	38·5	**S. 8**	13·8	13·9	13·9	13·9	13·8	13·8
2·9	β Eridani		**283**	18·8	18·9	19·0	19·1	19·2	19·2	**S. 5**	07·1	07·2	07·2	07·2	07·1	07·0
2·9	ι Aurigæ †		**286**	07·1	07·1	07·3	07·4	07·5	07·4	**N. 33**	07·8	07·8	07·8	07·8	07·8	07·7
1·1	α Tauri	10	**291**	20·6	20·7	20·8	20·9	20·9	20·9	**N. 16**	27·8	27·7	27·7	27·7	27·7	27·7
3·2	γ Eridani		**300**	45·3	45·4	45·6	45·7	45·7	45·6	**S. 13**	34·6	34·6	34·6	34·6	34·5	34·4
3·0	ε Persei		**300**	54·9	55·0	55·2	55·3	55·3	55·2	**N. 39**	56·7	56·8	56·7	56·7	56·6	56·6
2·9	ζ Persei		**301**	49·3	49·4	49·5	49·7	49·7	49·5	**N. 31**	49·0	49·0	49·0	48·9	48·9	48·9
3·0	η Tauri		**303**	27·9	28·0	28·1	28·2	28·2	28·1	**N. 24**	02·1	02·1	02·1	02·0	02·0	02·0
1·9	α Persei	9	**309**	19·3	19·5	19·7	19·8	19·8	19·6	**N. 49**	47·0	47·0	46·9	46·8	46·7	46·7
Var.§	β Persei †		**313**	19·5	19·7	19·8	19·9	19·9	19·7	**N. 40**	52·2	52·2	52·1	52·1	52·0	52·0
2·8	α Ceti	8	**314**	43·6	43·7	43·8	43·9	43·8	43·7	**N. 3**	59·9	59·9	59·9	59·9	59·9	60·0
3·1	θ Eridani	7	**315**	39·0	39·1	39·3	39·4	39·4	39·3	**S. 40**	24·1	24·1	24·0	23·9	23·8	23·6
2·1	α Ursæ Minoris †		**327**	27·8	38·6	47·2	51·2	48·8	40·7	**N. 89**	09·9	09·9	09·8	09·6	09·5	09·4
3·1	β Trianguli		**327**	57·1	57·3	57·4	57·4	57·3	57·1	**N. 34**	52·9	52·9	52·8	52·7	52·7	52·7
2·2	α Arietis	6	**328**	31·6	31·7	31·8	31·9	31·8	31·6	**N. 23**	21·3	21·3	21·2	21·2	21·2	21·2
2·2	γ Andromedæ		**329**	22·4	22·6	22·7	22·7	22·6	22·4	**N. 42**	13·4	13·3	13·3	13·2	13·1	13·1
3·0	α Hydri		**330**	29·4	29·7	29·9	30·0	29·9	29·7	**S. 61**	41·2	41·2	41·1	40·9	40·7	40·6
2·7	β Arietis		**331**	39·3	39·4	39·4	39·5	39·4	39·2	**N. 20**	41·8	41·8	41·8	41·7	41·7	41·8
0·6	α Eridani	5	**335**	47·2	47·4	47·6	47·6	47·6	47·3	**S. 57**	21·5	21·5	21·3	21·2	21·0	20·8
2·8	δ Cassiopeiæ		**338**	55·1	55·4	55·5	55·5	55·4	55·0	**N. 60**	07·3	07·2	07·1	07·0	06·9	06·8
2·4	β Andromedæ		**342**	53·2	53·3	53·4	53·4	53·2	53·0	**N. 35**	30·1	30·1	30·0	29·9	29·9	29·9
Var.‖	γ Cassiopeiæ		**346**	10·1	10·3	10·4	10·4	10·2	09·8	**N. 60**	35·9	35·8	35·7	35·5	35·4	35·4
2·2	β Ceti	4	**349**	23·4	23·5	23·6	23·5	23·4	23·2	**S. 18**	06·9	06·9	06·8	06·7	06·6	06·5
2·5	α Cassiopeiæ	3	**350**	11·9	12·1	12·2	12·1	11·9	11·6	**N. 56**	25·0	24·9	24·8	24·7	24·6	24·6
2·4	α Phœnicis	2	**353**	42·8	43·0	43·0	43·0	42·8	42·6	**S. 42**	26·1	26·0	25·9	25·7	25·6	25·5
2·9	β Hydri †		**353**	52·4	53·0	53·2	53·2	52·8	52·1	**S. 77**	23·3	23·2	23·0	22·8	22·6	22·5
2·9	γ Pegasi		**356**	59·2	59·2	59·3	59·2	59·1	58·8	**N. 15**	03·4	03·4	03·3	03·3	03·4	03·4
2·4	β Cassiopeiæ		**358**	00·7	00·9	01·0	00·9	00·6	00·3	**N. 59**	01·7	01·6	01·5	01·3	01·3	01·3
2·2	α Andromedæ	1	**358**	12·0	12·1	12·1	12·0	11·8	11·6	**N. 28**	58·0	57·9	57·8	57·8	57·8	57·8

‡ 0·1—1·2 §2·3—3·5 ‖ Irregular variable; 1974 mag. 2·5 † Not suitable for use with H.O. 214 (H.D. 486)

Mag.	Name and Number		S.H.A.							Dec.					
				JULY	AUG.	SEPT.	OCT.	NOV.	DEC.		JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
			°	′	′	′	′	′	′	°	′	′	′	′	′	′
1·6	*Castor*		**246**	42·8	42·7	42·5	42·2	41·9	41·7	**N. 31**	56·2	56·2	56·1	56·1	56·1	56·0
3·3	σ Puppis		**247**	52·6	52·5	52·3	52·0	51·8	51·5	**S. 43**	15·4	15·3	15·2	15·2	15·3	15·4
3·1	β Canis Minoris		**248**	31·3	31·1	31·0	30·8	30·5	30·3	**N. 8**	20·0	20·1	20·1	20·0	20·0	19·9
2·4	η Canis Majoris		**249**	12·2	12·1	11·9	11·7	11·4	11·3	**S. 29**	15·6	15·5	15·4	15·4	15·5	15·6
2·7	π Puppis		**250**	55·1	55·0	54·8	54·5	54·3	54·1	**S. 37**	03·5	03·4	03·3	03·3	03·3	03·5
2·0	*Wezen*		**253**	08·1	08·0	07·8	07·6	07·4	07·2	**S. 26**	21·5	21·4	21·3	21·3	21·4	21·5
3·1	ο Canis Majoris		**254**	29·0	28·9	28·7	28·5	28·2	28·0	**S. 23**	48·1	48·0	47·9	47·9	48·0	48·1
1·6	*Adhara*	19	**255**	34·2	34·0	33·8	33·6	33·4	33·2	**S. 28**	56·5	56·4	56·3	56·3	56·4	56·6
2·8	τ Puppis		**257**	39·8	39·6	39·4	39·1	38·8	38·6	**S. 50**	35·3	35·2	35·1	35·1	35·2	35·3
−1·6	*Sirius*	18	**258**	57·9	57·8	57·6	57·4	57·2	57·0	**S. 16**	41·2	41·1	41·0	41·1	41·1	41·3
1·9	*Alhena*		**260**	54·0	53·9	53·7	53·4	53·2	53·0	**N. 16**	25·1	25·1	25·1	25·1	25·0	25·0
−0·9	*Canopus*	17	**264**	08·7	08·5	08·2	07·9	07·6	07·5	**S. 52**	41·0	40·9	40·8	40·8	40·9	41·1
2·0	*Mirzam*		**264**	34·6	34·5	34·3	34·0	33·8	33·7	**S. 17**	56·7	56·6	56·6	56·6	56·7	56·8
2·7	θ Aurigæ		**270**	27·4	27·2	27·0	26·7	26·4	26·3	**N. 37**	12·6	12·5	12·5	12·5	12·5	12·6
2·1	*Menkalinan*		**270**	32·1	31·9	31·6	31·3	31·0	30·8	**N. 44**	56·6	56·6	56·5	56·5	56·6	56·6
Var.‡	*Betelgeuse*	16	**271**	30·9	30·7	30·5	30·3	30·1	29·9	**N. 7**	24·1	24·2	24·2	24·2	24·1	24·1
2·2	κ Orionis		**273**	19·9	19·7	19·5	19·3	19·1	19·0	**S. 9**	40·7	40·6	40·5	40·6	40·6	40·7
1·9	*Alnitak*		**275**	05·8	05·7	05·5	05·3	05·1	04·9	**S. 1**	57·3	57·2	57·2	57·2	57·3	57·3
2·8	*Phact*		**275**	17·8	17·6	17·4	17·1	16·9	16·8	**S. 34**	05·1	05·0	05·0	05·0	05·1	05·3
3·0	ζ Tauri		**275**	55·7	55·5	55·3	55·0	54·8	54·7	**N. 21**	07·7	07·7	07·7	07·7	07·7	07·7
1·8	*Alnilam*	15	**276**	14·1	13·9	13·7	13·5	13·3	13·2	**S. 1**	13·0	12·9	12·9	12·9	13·0	13·0
2·9	ι Orionis		**276**	25·2	25·0	24·8	24·6	24·4	24·3	**S. 5**	55·5	55·4	55·4	55·4	55·5	55·5
2·7	α Leporis		**277**	04·2	04·0	03·8	03·6	03·4	03·3	**S. 17**	50·3	50·2	50·1	50·2	50·3	50·4
2·5	δ Orionis		**277**	17·3	17·2	16·9	16·7	16·5	16·4	**S. 0**	19·0	18·9	18·9	18·9	18·9	19·0
3·0	β Leporis		**278**	11·0	10·8	10·6	10·4	10·2	10·1	**S. 20**	46·6	46·5	46·5	46·5	46·6	46·7
1·8	*Elnath*	14	**278**	47·1	46·9	46·7	46·4	46·2	46·1	**N. 28**	35·2	35·2	35·2	35·2	35·3	35·3
1·7	*Bellatrix*	13	**279**	01·3	01·1	00·9	00·7	00·5	00·4	**N. 6**	19·7	19·8	19·8	19·8	19·8	19·7
0·2	*Capella*	12	**281**	14·8	14·6	14·3	14·0	13·7	13·5	**N. 45**	58·4	58·3	58·4	58·4	58·4	58·5
0·3	*Rigel*	11	**281**	38·3	38·2	37·9	37·7	37·6	37·5	**S. 8**	13·7	13·6	13·5	13·6	13·6	13·7
2·9	β Eridani		**283**	19·0	18·8	18·6	18·4	18·3	18·2	**S. 5**	06·9	06·9	06·8	06·8	06·9	07·0
2·9	ι Aurigæ †		**286**	07·3	07·0	06·8	06·5	06·3	06·2	**N. 33**	07·7	07·7	07·7	07·8	07·8	07·8
1·1	*Aldebaran*	10	**291**	20·7	20·5	20·2	20·0	19·9	19·8	**N. 16**	27·8	27·8	27·9	27·9	27·9	27·9
3·2	γ Eridani		**300**	45·4	45·2	45·0	44·8	44·7	44·7	**S. 13**	34·3	34·2	34·2	34·2	34·3	34·4
3·0	ϵ Persei		**300**	55·0	54·7	54·4	54·2	54·0	53·9	**N. 39**	56·5	56·6	56·6	56·7	56·8	56·8
2·9	ζ Persei		**301**	49·3	49·1	48·8	48·6	48·5	48·4	**N. 31**	48·9	48·9	49·0	49·0	49·1	49·1
3·0	*Alcyone*		**303**	27·9	27·6	27·4	27·2	27·1	27·0	**N. 24**	02·0	02·1	02·1	02·2	02·2	02·2
1·9	*Mirfak*	9	**309**	19·3	19·0	18·7	18·5	18·3	18·3	**N. 49**	46·7	46·7	46·8	46·9	47·0	47·1
Var.§	*Algol* †		**313**	19·5	19·2	18·9	18·7	18·6	18·6	**N. 40**	52·0	52·0	52·1	52·2	52·3	52·4
2·8	*Menkar*	8	**314**	43·5	43·3	43·1	42·9	42·8	42·8	**N. 4**	00·1	00·2	00·2	00·2	00·2	00·2
3·1	*Acamar*	7	**315**	39·1	38·8	38·6	38·4	38·3	38·3	**S. 40**	23·5	23·4	23·4	23·5	23·6	23·8
2·1	*Polaris* †		**327**	29·8	18·1	08·1	01·9	00·7	05·3	**N. 89**	09·3	09·4	09·5	09·7	09·9	10·0
3·1	β Trianguli		**327**	56·9	56·6	56·4	56·2	56·2	56·2	**N. 34**	52·7	52·8	52·9	53·0	53·1	53·1
2·2	*Hamal*	6	**328**	31·4	31·1	30·9	30·8	30·7	30·8	**N. 23**	21·3	21·4	21·5	21·5	21·6	21·6
2·2	*Almak*		**329**	22·1	21·8	21·6	21·5	21·4	21·5	**N. 42**	13·1	13·2	13·3	13·4	13·5	13·6
3·0	α Hydri		**330**	29·4	29·0	28·6	28·5	28·5	28·7	**S. 61**	40·4	40·4	40·5	40·6	40·8	40·9
2·7	*Sheratan*		**331**	39·0	38·7	38·5	38·4	38·4	38·4	**N. 20**	41·8	41·9	42·0	42·1	42·1	42·1
0·6	*Achernar*	5	**335**	47·0	46·6	46·4	46·2	46·3	46·4	**S. 57**	20·7	20·7	20·8	20·9	21·1	21·2
2·8	*Ruchbah*		**338**	54·6	54·2	54·0	53·8	53·8	54·0	**N. 60**	06·9	07·0	07·1	07·3	07·4	07·5
2·4	*Mirach*		**342**	52·7	52·5	52·3	52·2	52·2	52·3	**N. 35**	30·0	30·1	30·2	30·3	30·4	30·4
Var.‖	γ Cassiopeiæ		**346**	09·4	09·1	08·8	08·7	08·8	08·9	**N. 60**	35·5	35·6	35·7	35·9	36·0	36·1
2·2	*Diphda*	4	**349**	23·0	22·7	22·6	22·6	22·6	22·7	**S. 18**	06·4	06·4	06·4	06·4	06·5	06·5
2·5	*Schedar*	3	**350**	11·2	10·9	10·7	10·6	10·7	10·8	**N. 56**	24·6	24·8	24·9	25·1	25·2	25·3
2·4	*Ankaa*	2	**353**	42·3	42·0	41·9	41·8	41·9	42·0	**S. 42**	25·4	25·4	25·4	25·6	25·7	25·7
2·9	β Hydri †		**353**	51·3	50·6	50·1	50·1	50·5	51·1	**S. 77**	22·5	22·5	22·7	22·8	23·0	23·0
2·9	*Algenib*		**356**	58·6	58·4	58·3	58·3	58·3	58·4	**N. 15**	03·5	03·6	03·7	03·8	03·8	03·8
2·4	*Caph*		**357**	59·9	59·6	59·4	59·4	59·5	59·7	**N. 59**	01·4	01·5	01·7	01·8	02·0	02·0
2·2	*Alpheratz*	1	**358**	11·4	11·1	11·0	11·0	11·0	11·1	**N. 28**	57·9	58·0	58·2	58·3	58·3	58·3

‡ 0·1—1·2 § 2·3—3·5 ‖ Irregular variable; 1974 mag. 2·5 † Not suitable for use with H.O. 214 (H.D. 486)

POLARIS (POLE STAR) TABLES, 1977

FOR DETERMINING LATITUDE FROM SEXTANT ALTITUDE AND FOR AZIMUTH

L.H.A. ARIES	0°– 9°	10°– 19°	20°– 29°	30°– 39°	40°– 49°	50°– 59°	60°– 69°	70°– 79°	80°– 89°	90°– 99°	100°– 109°	110°– 119°
	a_0	a_0	a_0	a_0	a_0	a_0	a_0	a_0	a_0	a_0	a_0	a_0
°	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
0	0 16·5	0 12·4	0 09·7	0 08·6	0 08·9	0 10·8	0 14·2	0 19·0	0 25·0	0 32·0	0 39·9	0 48·3
1	16·1	12·1	09·5	08·5	09·1	11·1	14·7	19·6	25·7	32·8	40·7	49·1
2	15·6	11·8	09·4	08·5	09·2	11·4	15·1	20·1	26·3	33·5	41·5	50·0
3	15·2	11·5	09·2	08·5	09·3	11·7	15·5	20·7	27·0	34·3	42·3	50·9
4	14·7	11·2	09·1	08·5	09·5	12·0	16·0	21·3	27·7	35·1	43·2	51·7
5	0 14·3	0 10·9	0 08·9	0 08·5	0 09·7	0 12·4	0 16·5	0 21·9	0 28·4	0 35·9	0 44·0	0 52·6
6	13·9	10·6	08·8	08·6	09·9	12·7	17·0	22·5	29·1	36·7	44·9	53·5
7	13·5	10·4	08·7	08·7	10·1	13·1	17·5	23·1	29·8	37·4	45·7	54·4
8	13·1	10·1	08·7	08·7	10·3	13·5	18·0	23·7	30·6	38·3	46·6	55·2
9	12·8	09·9	08·6	08·8	10·6	13·8	18·5	24·4	31·3	39·1	47·4	56·1
10	0 12·4	0 09·7	0 08·6	0 08·9	0 10·8	0 14·2	0 19·0	0 25·0	0 32·0	0 39·9	0 48·3	0 57·0
Lat.	a_1	a_1	a_1	a_1	a_1	a_1	a_1	a_1	a_1	a_1	a_1	a_1
°	′	′	′	′	′	′	′	′	′	′	′	′
0	0·5	0·6	0·6	0·6	0·6	0·5	0·5	0·4	0·3	0·3	0·2	0·2
10	·5	·6	·6	·6	·6	·5	·5	·4	·4	·3	·3	·2
20	·5	·6	·6	·6	·6	·6	·5	·5	·4	·4	·3	·3
30	·6	·6	·6	·6	·6	·6	·5	·5	·5	·4	·4	·4
40	0·6	0·6	0·6	0·6	0·6	0·6	0·6	0·5	0·5	0·5	0·5	0·5
45	·6	·6	·6	·6	·6	·6	·6	·6	·6	·5	·5	·5
50	·6	·6	·6	·6	·6	·6	·6	·6	·6	·6	·6	·6
55	·6	·6	·6	·6	·6	·6	·6	·6	·7	·7	·7	·7
60	·6	·6	·6	·6	·6	·6	·7	·7	·7	·8	·8	·8
62	0·7	0·6	0·6	0·6	0·6	0·6	0·7	0·7	0·8	0·8	0·8	0·8
64	·7	·6	·6	·6	·6	·6	·7	·7	·8	·8	0·9	0·9
66	·7	·6	·6	·6	·6	·7	·7	·8	·8	0·9	1·0	1·0
68	0·7	0·6	0·6	0·6	0·6	0·7	0·7	0·8	0·9	1·0	1·0	1·1
Month	a_2	a_2	a_2	a_2	a_2	a_2	a_2	a_2	a_2	a_2	a_2	a_2
	′	′	′	′	′	′	′	′	′	′	′	′
Jan.	0·7	0·8	0·8	0·8	0·8	0·8	0·8	0·7	0·7	0·7	0·7	0·7
Feb.	·7	·7	·7	·8	·8	·8	·8	·8	·8	·8	·8	·8
Mar.	·5	·6	·6	·7	·7	·8	·8	·9	·9	·9	·9	·9
Apr.	0·4	0·4	0·5	0·5	0·6	0·7	0·7	0·8	0·8	0·9	0·9	0·9
May	·3	·3	·3	·4	·5	·5	·6	·7	·7	·8	·8	·9
June	·2	·2	·3	·3	·3	·4	·4	·5	·6	·6	·7	·8
July	0·3	0·3	0·3	0·3	0·3	0·3	0·3	0·4	0·4	0·5	0·5	0·6
Aug.	·4	·4	·3	·3	·3	·3	·3	·3	·3	·4	·4	·4
Sept.	·6	·5	·5	·4	·4	·3	·3	·3	·3	·3	·3	·3
Oct.	0·7	0·7	0·6	0·6	0·5	0·5	0·4	0·4	0·3	0·3	0·3	0·3
Nov.	0·9	0·9	0·8	·8	·7	·6	·6	·5	·4	·4	·3	·3
Dec.	1·0	1·0	1·0	0·9	0·9	0·8	0·7	0·6	0·6	0·5	0·4	0·4
Lat.	AZIMUTH											
°	°	°	°	°	°	°	°	°	°	°	°	°
0	0·4	0·3	0·1	0·0	359·8	359·7	359·6	359·4	359·3	359·3	359·2	359·2
20	0·4	0·3	0·1	0·0	359·8	359·7	359·5	359·4	359·3	359·2	359·1	359·1
40	0·5	0·3	0·1	0·0	359·8	359·6	359·4	359·3	359·1	359·0	359·0	358·9
50	0·6	0·4	0·2	359·9	359·7	359·5	359·3	359·1	359·0	358·8	358·8	358·7
55	0·7	0·4	0·2	359·9	359·7	359·4	359·2	359·0	358·8	358·7	358·6	358·5
60	0·8	0·5	0·2	359·9	359·6	359·3	359·1	358·8	358·7	358·5	358·4	358·3
65	0·9	0·6	0·3	359·9	359·6	359·2	358·9	358·6	358·4	358·2	358·1	358·0

$$\text{Latitude} = \text{Apparent altitude (corrected for refraction)} - 1^\circ + a_0 + a_1 + a_2$$

The table is entered with L.H.A. Aries to determine the column to be used; each column refers to a range of 10°. a_0 is taken, with mental interpolation, from the upper table with the units of L.H.A. Aries in degrees as argument; a_1, a_2 are taken, without interpolation, from the second and third tables with arguments latitude and month respectively. a_0, a_1, a_2 are always positive. The final table gives the azimuth of *Polaris*.

POLARIS (POLE STAR) TABLES, 1977

FOR DETERMINING LATITUDE FROM SEXTANT ALTITUDE AND FOR AZIMUTH

L.H.A. ARIES	120°–129°	130°–139°	140°–149°	150°–159°	160°–169°	170°–179°	180°–189°	190°–199°	200°–209°	210°–219°	220°–229°	230°–239°
	a_0	a_0	a_0	a_0	a_0	a_0	a_0	a_0	a_0	a_0	a_0	a_0
°	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
0	0 57·0	1 05·7	1 14·3	1 22·3	1 29·7	1 36·0	1 41·3	1 45·3	1 47·9	1 49·1	1 48·7	1 46·8
1	57·9	06·6	15·1	23·1	30·3	36·6	41·8	45·6	48·1	49·1	48·6	46·6
2	58·7	07·5	15·9	23·9	31·0	37·2	42·2	45·9	48·3	49·1	48·4	46·3
3	0 59·6	08·3	16·7	24·6	31·7	37·8	42·7	46·2	48·4	49·1	48·3	46·0
4	1 00·5	09·2	17·6	25·4	32·3	38·3	43·1	46·5	48·5	49·1	48·1	45·7
5	1 01·4	1 10·0	1 18·4	1 26·1	1 33·0	1 38·8	1 43·5	1 46·8	1 48·7	1 49·1	1 47·9	1 45·4
6	02·2	10·9	19·2	26·8	33·6	39·4	43·9	47·0	48·8	49·0	47·7	45·0
7	03·1	11·7	20·0	27·5	34·2	39·9	44·3	47·3	48·9	49·0	47·5	44·7
8	04·0	12·6	20·8	28·3	34·9	40·4	44·6	47·5	48·9	48·9	47·3	44·3
9	04·9	13·4	21·5	29·0	35·5	40·8	45·0	47·7	49·0	48·8	47·1	43·9
10	1 05·7	1 14·3	1 22·3	1 29·7	1 36·0	1 41·3	1 45·3	1 47·9	1 49·1	1 48·7	1 46·8	1 43·5
Lat.	a_1	a_1	a_1	a_1	a_1	a_1	a_1	a_1	a_1	a_1	a_1	a_1
°	′	′	′	′	′	′	′	′	′	′	′	′
0	0·2	0·2	0·2	0·3	0·4	0·4	0·5	0·6	0·6	0·6	0·6	0·5
10	·2	·2	·3	·3	·4	·5	·5	·6	·6	·6	·6	·5
20	·3	·3	·3	·4	·4	·5	·5	·6	·6	·6	·6	·6
30	·4	·4	·4	·4	·5	·5	·6	·6	·6	·6	·6	·6
40	0·5	0·5	0·5	0·5	0·5	0·6	0·6	0·6	0·6	0·6	0·6	0·6
45	·5	·5	·5	·5	·6	·6	·6	·6	·6	·6	·6	·6
50	·6	·6	·6	·6	·6	·6	·6	·6	·6	·6	·6	·6
55	·7	·7	·7	·7	·6	·6	·6	·6	·6	·6	·6	·6
60	·8	·8	·8	·7	·7	·7	·6	·6	·6	·6	·6	·6
62	0·9	0·8	0·8	0·8	0·7	0·7	0·7	0·6	0·6	0·6	0·6	0·6
64	0·9	0·9	·9	·8	·8	·7	·7	·6	·6	·6	·6	·6
66	1·0	1·0	0·9	·9	·8	·7	·7	·6	·6	·6	·6	·7
68	1·1	1·1	1·0	0·9	0·9	0·8	0·7	0·6	0·6	0·6	0·6	0·7
Month	a_2	a_2	a_2	a_2	a_2	a_2	a_2	a_2	a_2	a_2	a_2	a_2
	′	′	′	′	′	′	′	′	′	′	′	′
Jan.	0·6	0·6	0·6	0·5	0·5	0·5	0·5	0·4	0·4	0·4	0·4	0·4
Feb.	·8	·7	·7	·7	·6	·6	·5	·5	·5	·4	·4	·4
Mar.	0·9	0·9	0·9	·8	·8	·7	·7	·6	·6	·5	·5	·4
Apr.	1·0	1·0	1·0	0·9	0·9	0·9	0·8	0·8	0·7	0·7	0·6	0·5
May	0·9	1·0	1·0	1·0	1·0	1·0	0·9	0·9	·9	·8	·7	·7
June	·8	0·9	0·9	0·9	1·0	1·0	1·0	1·0	·9	·9	·9	·8
July	0·7	0·7	0·8	0·8	0·9	0·9	0·9	0·9	0·9	0·9	0·9	0·9
Aug.	·5	·5	·6	·7	·7	·8	·8	·8	·9	·9	·9	·9
Sept.	·3	·4	·4	·5	·5	·6	·6	·7	·7	·8	·8	·9
Oct.	0·3	0·3	0·3	0·3	0·4	0·4	0·5	0·5	0·6	0·6	0·7	0·7
Nov.	·2	·2	·2	·2	·2	·2	·3	·3	·4	·4	·5	·6
Dec.	0·3	0·2	0·2	0·2	0·2	0·2	0·2	0·2	0·2	0·3	0·3	0·4
Lat.	AZIMUTH											
°	°	°	°	°	°	°	°	°	°	°	°	°
0	359·2	359·2	359·2	359·3	359·4	359·5	359·6	359·7	359·9	0·0	0·2	0·3
20	359·1	359·1	359·2	359·2	359·3	359·5	359·6	359·7	359·9	0·0	0·2	0·3
40	358·9	358·9	359·0	359·1	359·2	359·3	359·5	359·7	359·9	0·0	0·2	0·4
50	358·7	358·7	358·8	358·9	359·0	359·2	359·4	359·6	359·8	0·1	0·3	0·5
55	358·5	358·6	358·7	358·8	358·9	359·1	359·3	359·6	359·8	0·1	0·3	0·5
60	358·3	358·4	358·5	358·6	358·8	359·0	359·2	359·5	359·8	0·1	0·4	0·6
65	358·0	358·1	358·2	358·4	358·6	358·8	359·1	359·4	359·7	0·1	0·4	0·7

ILLUSTRATION

On 1977 May 22 at G.M.T. 23h 18m 56s in longitude W. 37° 14′ the corrected sextant altitude of *Polaris* was 49° 31′·6.

From the daily pages:	° ′
G.H.A. Aries (23h)	225 27·1
Increment (18m 56s)	4 44·8
Longitude (west)	−37 14
L.H.A. Aries	192 58

	° ′
Corr. Sext. Alt.	49 31·6
a_0 (argument 192° 58′)	1 46·2
a_1 (lat. 50° approx.)	0·6
a_2 (May)	0·9
Sum −1° = Lat. =	50 19·3

POLARIS (POLE STAR) TABLES, 1977

FOR DETERMINING LATITUDE FROM SEXTANT ALTITUDE AND FOR AZIMUTH

L.H.A. ARIES	240°–249°	250°–259°	260°–269°	270°–279°	280°–289°	290°–299°	300°–309°	310°–319°	320°–329°	330°–339°	340°–349°	350°–359°
	a_0	a_0	a_0	a_0	a_0	a_0	a_0	a_0	a_0	a_0	a_0	a_0
°	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
0	1 43·5	1 38·9	1 33·1	1 26·2	1 18·5	1 10·2	1 01·5	0 52·7	0 44·1	0 36·0	0 28·5	0 22·0
1	43·1	38·4	32·4	25·5	17·7	09·3	1 00·6	51·9	43·3	35·2	27·8	21·4
2	42·7	37·8	31·8	24·7	16·9	08·4	0 59·7	51·0	42·5	34·4	27·1	20·8
3	42·3	37·3	31·1	24·0	16·0	07·6	58·9	50·1	41·6	33·6	26·4	20·2
4	41·8	36·7	30·4	23·2	15·2	06·7	58·0	49·3	40·8	32·9	25·8	19·6
5	1 41·4	1 36·1	1 29·7	1 22·4	1 14·4	1 05·9	0 57·1	0 48·4	0 40·0	0 32·1	0 25·1	0 19·1
6	40·9	35·5	29·0	21·6	13·5	05·0	56·2	47·5	39·2	31·4	24·4	18·6
7	40·4	34·9	28·3	20·9	12·7	04·1	55·3	46·7	38·4	30·7	23·8	18·0
8	39·9	34·3	27·6	20·1	11·9	03·2	54·5	45·8	37·6	29·9	23·2	17·5
9	39·4	33·7	26·9	19·3	11·0	02·4	53·6	45·0	36·8	29·2	22·6	17·0
10	1 38·9	1 33·1	1 26·2	1 18·5	1 10·2	1 01·5	0 52·7	0 44·1	0 36·0	0 28·5	0 22·0	0 16·5
Lat.	a_1	a_1	a_1	a_1	a_1	a_1	a_1	a_1	a_1	a_1	a_1	a_1
°	′	′	′	′	′	′	′	′	′	′	′	′
0	0·5	0·4	0·3	0·3	0·2	0·2	0·2	0·2	0·2	0·3	0·4	0·4
10	·5	·4	·4	·3	·3	·2	·2	·2	·3	·3	·4	·5
20	·5	·5	·4	·4	·3	·3	·3	·3	·3	·4	·4	·5
30	·5	·5	·5	·4	·4	·4	·4	·4	·4	·4	·5	·5
40	0·6	0·5	0·5	0·5	0·5	0·5	0·5	0·5	0·5	0·5	0·5	0·6
45	·6	·6	·6	·5	·5	·5	·5	·5	·5	·5	·6	·6
50	·6	·6	·6	·6	·6	·6	·6	·6	·6	·6	·6	·6
55	·6	·6	·7	·7	·7	·7	·7	·7	·7	·7	·6	·6
60	·7	·7	·7	·8	·8	·8	·8	·8	·8	·7	·7	·7
62	0·7	0·7	0·8	0·8	0·8	0·8	0·9	0·8	0·8	0·8	0·7	0·7
64	·7	·7	·8	·8	0·9	0·9	0·9	0·9	·9	·8	·8	·7
66	·7	·8	·8	0·9	1·0	1·0	1·0	1·0	0·9	·9	·8	·7
68	0·7	0·8	0·9	1·0	1·0	1·1	1·1	1·1	1·0	0·9	0·9	0·8
Month	a_2	a_2	a_2	a_2	a_2	a_2	a_2	a_2	a_2	a_2	a_2	a_2
	′	′	′	′	′	′	′	′	′	′	′	′
Jan.	0·4	0·5	0·5	0·5	0·5	0·5	0·6	0·6	0·6	0·7	0·7	0·7
Feb.	·4	·4	·4	·4	·4	·4	·4	·5	·5	·5	·6	·6
Mar.	·4	·3	·3	·3	·3	·3	·3	·3	·3	·4	·4	·5
Apr.	0·5	0·4	0·4	0·3	0·3	0·3	0·2	0·2	0·2	0·3	0·3	0·3
May	·6	·5	·5	·4	·4	·3	·3	·2	·2	·2	·2	·2
June	·8	·7	·6	·6	·5	·4	·4	·3	·3	·3	·2	·2
July	0·9	0·8	0·8	0·7	0·7	0·6	0·5	0·5	0·4	0·4	0·3	0·3
Aug.	·9	·9	·9	·8	·8	·8	·7	·7	·6	·5	·5	·4
Sept.	·9	·9	·9	·9	·9	·9	·9	·8	·8	·7	·7	·6
Oct.	0·8	0·8	0·9	0·9	0·9	0·9	0·9	0·9	0·9	0·9	0·8	0·8
Nov.	·6	·7	·8	·8	·9	·9	1·0	1·0	1·0	1·0	1·0	1·0
Dec.	0·5	0·6	0·6	0·7	0·8	0·8	0·9	1·0	1·0	1·0	1·0	1·0
Lat.	AZIMUTH											
°	°	°	°	°	°	°	°	°	°	°	°	°
0	0·4	0·6	0·7	0·7	0·8	0·8	0·8	0·8	0·8	0·7	0·6	0·5
20	0·5	0·6	0·7	0·8	0·8	0·9	0·9	0·9	0·8	0·8	0·7	0·5
40	0·6	0·7	0·9	1·0	1·0	1·1	1·1	1·1	1·0	0·9	0·8	0·7
50	0·7	0·9	1·0	1·1	1·2	1·3	1·3	1·3	1·2	1·1	1·0	0·8
55	0·8	1·0	1·1	1·3	1·4	1·4	1·5	1·4	1·4	1·2	1·1	0·9
60	0·9	1·1	1·3	1·5	1·6	1·7	1·7	1·6	1·6	1·4	1·3	1·0
65	1·0	1·3	1·5	1·7	1·9	2·0	2·0	2·0	1·9	1·7	1·5	1·2

Latitude = Apparent altitude (corrected for refraction) $-1° + a_0 + a_1 + a_2$

The table is entered with L.H.A. Aries to determine the column to be used; each column refers to a range of 10°. a_0 is taken, with mental interpolation, from the upper table with the units of L.H.A. Aries in degrees as argument; a_1, a_2 are taken, without interpolation, from the second and third tables with arguments latitude and month respectively. a_0, a_1, a_2 are always positive. The final table gives the azimuth of *Polaris*.

CONVERSION OF ARC TO TIME

0°–59°		60°–119°		120°–179°		180°–239°		240°–299°		300°–359°			0′·00	0′·25	0′·50	0′·75
°	h m	°	h m	°	h m	°	h m	°	h m	°	h m	′	m s	m s	m s	m s
0	0 00	60	4 00	120	8 00	180	12 00	240	16 00	300	20 00	0	0 00	0 01	0 02	0 03
1	0 04	61	4 04	121	8 04	181	12 04	241	16 04	301	20 04	1	0 04	0 05	0 06	0 07
2	0 08	62	4 08	122	8 08	182	12 08	242	16 08	302	20 08	2	0 08	0 09	0 10	0 11
3	0 12	63	4 12	123	8 12	183	12 12	243	16 12	303	20 12	3	0 12	0 13	0 14	0 15
4	0 16	64	4 16	124	8 16	184	12 16	244	16 16	304	20 16	4	0 16	0 17	0 18	0 19
5	0 20	65	4 20	125	8 20	185	12 20	245	16 20	305	20 20	5	0 20	0 21	0 22	0 23
6	0 24	66	4 24	126	8 24	186	12 24	246	16 24	306	20 24	6	0 24	0 25	0 26	0 27
7	0 28	67	4 28	127	8 28	187	12 28	247	16 28	307	20 28	7	0 28	0 29	0 30	0 31
8	0 32	68	4 32	128	8 32	188	12 32	248	16 32	308	20 32	8	0 32	0 33	0 34	0 35
9	0 36	69	4 36	129	8 36	189	12 36	249	16 36	309	20 36	9	0 36	0 37	0 38	0 39
10	0 40	70	4 40	130	8 40	190	12 40	250	16 40	310	20 40	10	0 40	0 41	0 42	0 43
11	0 44	71	4 44	131	8 44	191	12 44	251	16 44	311	20 44	11	0 44	0 45	0 46	0 47
12	0 48	72	4 48	132	8 48	192	12 48	252	16 48	312	20 48	12	0 48	0 49	0 50	0 51
13	0 52	73	4 52	133	8 52	193	12 52	253	16 52	313	20 52	13	0 52	0 53	0 54	0 55
14	0 56	74	4 56	134	8 56	194	12 56	254	16 56	314	20 56	14	0 56	0 57	0 58	0 59
15	1 00	75	5 00	135	9 00	195	13 00	255	17 00	315	21 00	15	1 00	1 01	1 02	1 03
16	1 04	76	5 04	136	9 04	196	13 04	256	17 04	316	21 04	16	1 04	1 05	1 06	1 07
17	1 08	77	5 08	137	9 08	197	13 08	257	17 08	317	21 08	17	1 08	1 09	1 10	1 11
18	1 12	78	5 12	138	9 12	198	13 12	258	17 12	318	21 12	18	1 12	1 13	1 14	1 15
19	1 16	79	5 16	139	9 16	199	13 16	259	17 16	319	21 16	19	1 16	1 17	1 18	1 19
20	1 20	80	5 20	140	9 20	200	13 20	260	17 20	320	21 20	20	1 20	1 21	1 22	1 23
21	1 24	81	5 24	141	9 24	201	13 24	261	17 24	321	21 24	21	1 24	1 25	1 26	1 27
22	1 28	82	5 28	142	9 28	202	13 28	262	17 28	322	21 28	22	1 28	1 29	1 30	1 31
23	1 32	83	5 32	143	9 32	203	13 32	263	17 32	323	21 32	23	1 32	1 33	1 34	1 35
24	1 36	84	5 36	144	9 36	204	13 36	264	17 36	324	21 36	24	1 36	1 37	1 38	1 39
25	1 40	85	5 40	145	9 40	205	13 40	265	17 40	325	21 40	25	1 40	1 41	1 42	1 43
26	1 44	86	5 44	146	9 44	206	13 44	266	17 44	326	21 44	26	1 44	1 45	1 46	1 47
27	1 48	87	5 48	147	9 48	207	13 48	267	17 48	327	21 48	27	1 48	1 49	1 50	1 51
28	1 52	88	5 52	148	9 52	208	13 52	268	17 52	328	21 52	28	1 52	1 53	1 54	1 55
29	1 56	89	5 56	149	9 56	209	13 56	269	17 56	329	21 56	29	1 56	1 57	1 58	1 59
30	2 00	90	6 00	150	10 00	210	14 00	270	18 00	330	22 00	30	2 00	2 01	2 02	2 03
31	2 04	91	6 04	151	10 04	211	14 04	271	18 04	331	22 04	31	2 04	2 05	2 06	2 07
32	2 08	92	6 08	152	10 08	212	14 08	272	18 08	332	22 08	32	2 08	2 09	2 10	2 11
33	2 12	93	6 12	153	10 12	213	14 12	273	18 12	333	22 12	33	2 12	2 13	2 14	2 15
34	2 16	94	6 16	154	10 16	214	14 16	274	18 16	334	22 16	34	2 16	2 17	2 18	2 19
35	2 20	95	6 20	155	10 20	215	14 20	275	18 20	335	22 20	35	2 20	2 21	2 22	2 23
36	2 24	96	6 24	156	10 24	216	14 24	276	18 24	336	22 24	36	2 24	2 25	2 26	2 27
37	2 28	97	6 28	157	10 28	217	14 28	277	18 28	337	22 28	37	2 28	2 29	2 30	2 31
38	2 32	98	6 32	158	10 32	218	14 32	278	18 32	338	22 32	38	2 32	2 33	2 34	2 35
39	2 36	99	6 36	159	10 36	219	14 36	279	18 36	339	22 36	39	2 36	2 37	2 38	2 39
40	2 40	100	6 40	160	10 40	220	14 40	280	18 40	340	22 40	40	2 40	2 41	2 42	2 43
41	2 44	101	6 44	161	10 44	221	14 44	281	18 44	341	22 44	41	2 44	2 45	2 46	2 47
42	2 48	102	6 48	162	10 48	222	14 48	282	18 48	342	22 48	42	2 48	2 49	2 50	2 51
43	2 52	103	6 52	163	10 52	223	14 52	283	18 52	343	22 52	43	2 52	2 53	2 54	2 55
44	2 56	104	6 56	164	10 56	224	14 56	284	18 56	344	22 56	44	2 56	2 57	2 58	2 59
45	3 00	105	7 00	165	11 00	225	15 00	285	19 00	345	23 00	45	3 00	3 01	3 02	3 03
46	3 04	106	7 04	166	11 04	226	15 04	286	19 04	346	23 04	46	3 04	3 05	3 06	3 07
47	3 08	107	7 08	167	11 08	227	15 08	287	19 08	347	23 08	47	3 08	3 09	3 10	3 11
48	3 12	108	7 12	168	11 12	228	15 12	288	19 12	348	23 12	48	3 12	3 13	3 14	3 15
49	3 16	109	7 16	169	11 16	229	15 16	289	19 16	349	23 16	49	3 16	3 17	3 18	3 19
50	3 20	110	7 20	170	11 20	230	15 20	290	19 20	350	23 20	50	3 20	3 21	3 22	3 23
51	3 24	111	7 24	171	11 24	231	15 24	291	19 24	351	23 24	51	3 24	3 25	3 26	3 27
52	3 28	112	7 28	172	11 28	232	15 28	292	19 28	352	23 28	52	3 28	3 29	3 30	3 31
53	3 32	113	7 32	173	11 32	233	15 32	293	19 32	353	23 32	53	3 32	3 33	3 34	3 35
54	3 36	114	7 36	174	11 36	234	15 36	294	19 36	354	23 36	54	3 36	3 37	3 38	3 39
55	3 40	115	7 40	175	11 40	235	15 40	295	19 40	355	23 40	55	3 40	3 41	3 42	3 43
56	3 44	116	7 44	176	11 44	236	15 44	296	19 44	356	23 44	56	3 44	3 45	3 46	3 47
57	3 48	117	7 48	177	11 48	237	15 48	297	19 48	357	23 48	57	3 48	3 49	3 50	3 51
58	3 52	118	7 52	178	11 52	238	15 52	298	19 52	358	23 52	58	3 52	3 53	3 54	3 55
59	3 56	119	7 56	179	11 56	239	15 56	299	19 56	359	23 56	59	3 56	3 57	3 58	3 59

The above table is for converting expressions in arc to their equivalent in time; its main use in this Almanac is for the conversion of longitude for application to L.M.T. (*added* if *west*, *subtracted* if *east*) to give G.M.T. or vice versa, particularly in the case of sunrise, sunset, etc.

0ᵐ	SUN PLANETS	ARIES	MOON	*v* or *d*	Corrⁿ	*v* or *d*	Corrⁿ	*v* or *d*	Corrⁿ
s	° ′	° ′	° ′	′	′	′	′	′	′
00	0 00·0	0 00·0	0 00·0	0·0	0·0	6·0	0·1	12·0	0·1
01	0 00·3	0 00·3	0 00·2	0·1	0·0	6·1	0·1	12·1	0·1
02	0 00·5	0 00·5	0 00·5	0·2	0·0	6·2	0·1	12·2	0·1
03	0 00·8	0 00·8	0 00·7	0·3	0·0	6·3	0·1	12·3	0·1
04	0 01·0	0 01·0	0 01·0	0·4	0·0	6·4	0·1	12·4	0·1
05	0 01·3	0 01·3	0 01·2	0·5	0·0	6·5	0·1	12·5	0·1
06	0 01·5	0 01·5	0 01·4	0·6	0·0	6·6	0·1	12·6	0·1
07	0 01·8	0 01·8	0 01·7	0·7	0·0	6·7	0·1	12·7	0·1
08	0 02·0	0 02·0	0 01·9	0·8	0·0	6·8	0·1	12·8	0·1
09	0 02·3	0 02·3	0 02·1	0·9	0·0	6·9	0·1	12·9	0·1
10	0 02·5	0 02·5	0 02·4	1·0	0·0	7·0	0·1	13·0	0·1
11	0 02·8	0 02·8	0 02·6	1·1	0·0	7·1	0·1	13·1	0·1
12	0 03·0	0 03·0	0 02·9	1·2	0·0	7·2	0·1	13·2	0·1
13	0 03·3	0 03·3	0 03·1	1·3	0·0	7·3	0·1	13·3	0·1
14	0 03·5	0 03·5	0 03·3	1·4	0·0	7·4	0·1	13·4	0·1
15	0 03·8	0 03·8	0 03·6	1·5	0·0	7·5	0·1	13·5	0·1
16	0 04·0	0 04·0	0 03·8	1·6	0·0	7·6	0·1	13·6	0·1
17	0 04·3	0 04·3	0 04·1	1·7	0·0	7·7	0·1	13·7	0·1
18	0 04·5	0 04·5	0 04·3	1·8	0·0	7·8	0·1	13·8	0·1
19	0 04·8	0 04·8	0 04·5	1·9	0·0	7·9	0·1	13·9	0·1
20	0 05·0	0 05·0	0 04·8	2·0	0·0	8·0	0·1	14·0	0·1
21	0 05·3	0 05·3	0 05·0	2·1	0·0	8·1	0·1	14·1	0·1
22	0 05·5	0 05·5	0 05·2	2·2	0·0	8·2	0·1	14·2	0·1
23	0 05·8	0 05·8	0 05·5	2·3	0·0	8·3	0·1	14·3	0·1
24	0 06·0	0 06·0	0 05·7	2·4	0·0	8·4	0·1	14·4	0·1
25	0 06·3	0 06·3	0 06·0	2·5	0·0	8·5	0·1	14·5	0·1
26	0 06·5	0 06·5	0 06·2	2·6	0·0	8·6	0·1	14·6	0·1
27	0 06·8	0 06·8	0 06·4	2·7	0·0	8·7	0·1	14·7	0·1
28	0 07·0	0 07·0	0 06·7	2·8	0·0	8·8	0·1	14·8	0·1
29	0 07·3	0 07·3	0 06·9	2·9	0·0	8·9	0·1	14·9	0·1
30	0 07·5	0 07·5	0 07·2	3·0	0·0	9·0	0·1	15·0	0·1
31	0 07·8	0 07·8	0 07·4	3·1	0·0	9·1	0·1	15·1	0·1
32	0 08·0	0 08·0	0 07·6	3·2	0·0	9·2	0·1	15·2	0·1
33	0 08·3	0 08·3	0 07·9	3·3	0·0	9·3	0·1	15·3	0·1
34	0 08·5	0 08·5	0 08·1	3·4	0·0	9·4	0·1	15·4	0·1
35	0 08·8	0 08·8	0 08·4	3·5	0·0	9·5	0·1	15·5	0·1
36	0 09·0	0 09·0	0 08·6	3·6	0·0	9·6	0·1	15·6	0·1
37	0 09·3	0 09·3	0 08·8	3·7	0·0	9·7	0·1	15·7	0·1
38	0 09·5	0 09·5	0 09·1	3·8	0·0	9·8	0·1	15·8	0·1
39	0 09·8	0 09·8	0 09·3	3·9	0·0	9·9	0·1	15·9	0·1
40	0 10·0	0 10·0	0 09·5	4·0	0·0	10·0	0·1	16·0	0·1
41	0 10·3	0 10·3	0 09·8	4·1	0·0	10·1	0·1	16·1	0·1
42	0 10·5	0 10·5	0 10·0	4·2	0·0	10·2	0·1	16·2	0·1
43	0 10·8	0 10·8	0 10·3	4·3	0·0	10·3	0·1	16·3	0·1
44	0 11·0	0 11·0	0 10·5	4·4	0·0	10·4	0·1	16·4	0·1
45	0 11·3	0 11·3	0 10·7	4·5	0·0	10·5	0·1	16·5	0·1
46	0 11·5	0 11·5	0 11·0	4·6	0·0	10·6	0·1	16·6	0·1
47	0 11·8	0 11·8	0 11·2	4·7	0·0	10·7	0·1	16·7	0·1
48	0 12·0	0 12·0	0 11·5	4·8	0·0	10·8	0·1	16·8	0·1
49	0 12·3	0 12·3	0 11·7	4·9	0·0	10·9	0·1	16·9	0·1
50	0 12·5	0 12·5	0 11·9	5·0	0·0	11·0	0·1	17·0	0·1
51	0 12·8	0 12·8	0 12·2	5·1	0·0	11·1	0·1	17·1	0·1
52	0 13·0	0 13·0	0 12·4	5·2	0·0	11·2	0·1	17·2	0·1
53	0 13·3	0 13·3	0 12·6	5·3	0·0	11·3	0·1	17·3	0·1
54	0 13·5	0 13·5	0 12·9	5·4	0·0	11·4	0·1	17·4	0·1
55	0 13·8	0 13·8	0 13·1	5·5	0·0	11·5	0·1	17·5	0·1
56	0 14·0	0 14·0	0 13·4	5·6	0·0	11·6	0·1	17·6	0·1
57	0 14·3	0 14·3	0 13·6	5·7	0·0	11·7	0·1	17·7	0·1
58	0 14·5	0 14·5	0 13·8	5·8	0·0	11·8	0·1	17·8	0·1
59	0 14·8	0 14·8	0 14·1	5·9	0·0	11·9	0·1	17·9	0·1
60	0 15·0	0 15·0	0 14·3	6·0	0·1	12·0	0·1	18·0	0·2

Iᵐ	SUN PLANETS	ARIES	MOON	*v* or *d*	Corrⁿ	*v* or *d*	Corrⁿ	*v* or *d*	Corrⁿ
s	° ′	° ′	° ′	′	′	′	′	′	′
00	0 15·0	0 15·0	0 14·3	0·0	0·0	6·0	0·2	12·0	0·3
01	0 15·3	0 15·3	0 14·6	0·1	0·0	6·1	0·2	12·1	0·3
02	0 15·5	0 15·5	0 14·8	0·2	0·0	6·2	0·2	12·2	0·3
03	0 15·8	0 15·8	0 15·0	0·3	0·0	6·3	0·2	12·3	0·3
04	0 16·0	0 16·0	0 15·3	0·4	0·0	6·4	0·2	12·4	0·3
05	0 16·3	0 16·3	0 15·5	0·5	0·0	6·5	0·2	12·5	0·3
06	0 16·5	0 16·5	0 15·7	0·6	0·0	6·6	0·2	12·6	0·3
07	0 16·8	0 16·8	0 16·0	0·7	0·0	6·7	0·2	12·7	0·3
08	0 17·0	0 17·0	0 16·2	0·8	0·0	6·8	0·2	12·8	0·3
09	0 17·3	0 17·3	0 16·5	0·9	0·0	6·9	0·2	12·9	0·3
10	0 17·5	0 17·5	0 16·7	1·0	0·0	7·0	0·2	13·0	0·3
11	0 17·8	0 17·8	0 16·9	1·1	0·0	7·1	0·2	13·1	0·3
12	0 18·0	0 18·0	0 17·2	1·2	0·0	7·2	0·2	13·2	0·3
13	0 18·3	0 18·3	0 17·4	1·3	0·0	7·3	0·2	13·3	0·3
14	0 18·5	0 18·6	0 17·7	1·4	0·0	7·4	0·2	13·4	0·3
15	0 18·8	0 18·8	0 17·9	1·5	0·0	7·5	0·2	13·5	0·3
16	0 19·0	0 19·1	0 18·1	1·6	0·0	7·6	0·2	13·6	0·3
17	0 19·3	0 19·3	0 18·4	1·7	0·0	7·7	0·2	13·7	0·3
18	0 19·5	0 19·6	0 18·6	1·8	0·0	7·8	0·2	13·8	0·3
19	0 19·8	0 19·8	0 18·9	1·9	0·0	7·9	0·2	13·9	0·3
20	0 20·0	0 20·1	0 19·1	2·0	0·1	8·0	0·2	14·0	0·4
21	0 20·3	0 20·3	0 19·3	2·1	0·1	8·1	0·2	14·1	0·4
22	0 20·5	0 20·6	0 19·6	2·2	0·1	8·2	0·2	14·2	0·4
23	0 20·8	0 20·8	0 19·8	2·3	0·1	8·3	0·2	14·3	0·4
24	0 21·0	0 21·1	0 20·0	2·4	0·1	8·4	0·2	14·4	0·4
25	0 21·3	0 21·3	0 20·3	2·5	0·1	8·5	0·2	14·5	0·4
26	0 21·5	0 21·6	0 20·5	2·6	0·1	8·6	0·2	14·6	0·4
27	0 21·8	0 21·8	0 20·8	2·7	0·1	8·7	0·2	14·7	0·4
28	0 22·0	0 22·1	0 21·0	2·8	0·1	8·8	0·2	14·8	0·4
29	0 22·3	0 22·3	0 21·2	2·9	0·1	8·9	0·2	14·9	0·4
30	0 22·5	0 22·6	0 21·5	3·0	0·1	9·0	0·2	15·0	0·4
31	0 22·8	0 22·8	0 21·7	3·1	0·1	9·1	0·2	15·1	0·4
32	0 23·0	0 23·1	0 22·0	3·2	0·1	9·2	0·2	15·2	0·4
33	0 23·3	0 23·3	0 22·2	3·3	0·1	9·3	0·2	15·3	0·4
34	0 23·5	0 23·6	0 22·4	3·4	0·1	9·4	0·2	15·4	0·4
35	0 23·8	0 23·8	0 22·7	3·5	0·1	9·5	0·2	15·5	0·4
36	0 24·0	0 24·1	0 22·9	3·6	0·1	9·6	0·2	15·6	0·4
37	0 24·3	0 24·3	0 23·1	3·7	0·1	9·7	0·2	15·7	0·4
38	0 24·5	0 24·6	0 23·4	3·8	0·1	9·8	0·2	15·8	0·4
39	0 24·8	0 24·8	0 23·6	3·9	0·1	9·9	0·2	15·9	0·4
40	0 25·0	0 25·1	0 23·9	4·0	0·1	10·0	0·3	16·0	0·4
41	0 25·3	0 25·3	0 24·1	4·1	0·1	10·1	0·3	16·1	0·4
42	0 25·5	0 25·6	0 24·3	4·2	0·1	10·2	0·3	16·2	0·4
43	0 25·8	0 25·8	0 24·6	4·3	0·1	10·3	0·3	16·3	0·4
44	0 26·0	0 26·1	0 24·8	4·4	0·1	10·4	0·3	16·4	0·4
45	0 26·3	0 26·3	0 25·1	4·5	0·1	10·5	0·3	16·5	0·4
46	0 26·5	0 26·6	0 25·3	4·6	0·1	10·6	0·3	16·6	0·4
47	0 26·8	0 26·8	0 25·5	4·7	0·1	10·7	0·3	16·7	0·4
48	0 27·0	0 27·1	0 25·8	4·8	0·1	10·8	0·3	16·8	0·4
49	0 27·3	0 27·3	0 26·0	4·9	0·1	10·9	0·3	16·9	0·4
50	0 27·5	0 27·6	0 26·2	5·0	0·1	11·0	0·3	17·0	0·4
51	0 27·8	0 27·8	0 26·5	5·1	0·1	11·1	0·3	17·1	0·4
52	0 28·0	0 28·1	0 26·7	5·2	0·1	11·2	0·3	17·2	0·4
53	0 28·3	0 28·3	0 27·0	5·3	0·1	11·3	0·3	17·3	0·4
54	0 28·5	0 28·6	0 27·2	5·4	0·1	11·4	0·3	17·4	0·4
55	0 28·8	0 28·8	0 27·4	5·5	0·1	11·5	0·3	17·5	0·4
56	0 29·0	0 29·1	0 27·7	5·6	0·1	11·6	0·3	17·6	0·4
57	0 29·3	0 29·3	0 27·9	5·7	0·1	11·7	0·3	17·7	0·4
58	0 29·5	0 29·6	0 28·2	5·8	0·1	11·8	0·3	17·8	0·4
59	0 29·8	0 29·8	0 28·4	5·9	0·1	11·9	0·3	17·9	0·4
60	0 30·0	0 30·1	0 28·6	6·0	0·2	12·0	0·3	18·0	0·5

m 2	SUN PLANETS	ARIES	MOON	v or d	Corrⁿ	v or d	Corrⁿ	v or d	Corrⁿ
s	° ′	° ′	° ′	′	′	′	′	′	′
00	0 30·0	0 30·1	0 28·6	0·0	0·0	6·0	0·3	12·0	0·5
01	0 30·3	0 30·3	0 28·9	0·1	0·0	6·1	0·3	12·1	0·5
02	0 30·5	0 30·6	0 29·1	0·2	0·0	6·2	0·3	12·2	0·5
03	0 30·8	0 30·8	0 29·3	0·3	0·0	6·3	0·3	12·3	0·5
04	0 31·0	0 31·1	0 29·6	0·4	0·0	6·4	0·3	12·4	0·5
05	0 31·3	0 31·3	0 29·8	0·5	0·0	6·5	0·3	12·5	0·5
06	0 31·5	0 31·6	0 30·1	0·6	0·0	6·6	0·3	12·6	0·5
07	0 31·8	0 31·8	0 30·3	0·7	0·0	6·7	0·3	12·7	0·5
08	0 32·0	0 32·1	0 30·5	0·8	0·0	6·8	0·3	12·8	0·5
09	0 32·3	0 32·3	0 30·8	0·9	0·0	6·9	0·3	12·9	0·5
10	0 32·5	0 32·6	0 31·0	1·0	0·0	7·0	0·3	13·0	0·5
11	0 32·8	0 32·8	0 31·3	1·1	0·0	7·1	0·3	13·1	0·5
12	0 33·0	0 33·1	0 31·5	1·2	0·1	7·2	0·3	13·2	0·6
13	0 33·3	0 33·3	0 31·7	1·3	0·1	7·3	0·3	13·3	0·6
14	0 33·5	0 33·6	0 32·0	1·4	0·1	7·4	0·3	13·4	0·6
15	0 33·8	0 33·8	0 32·2	1·5	0·1	7·5	0·3	13·5	0·6
16	0 34·0	0 34·1	0 32·5	1·6	0·1	7·6	0·3	13·6	0·6
17	0 34·3	0 34·3	0 32·7	1·7	0·1	7·7	0·3	13·7	0·6
18	0 34·5	0 34·6	0 32·9	1·8	0·1	7·8	0·3	13·8	0·6
19	0 34·8	0 34·8	0 33·2	1·9	0·1	7·9	0·3	13·9	0·6
20	0 35·0	0 35·1	0 33·4	2·0	0·1	8·0	0·3	14·0	0·6
21	0 35·3	0 35·3	0 33·6	2·1	0·1	8·1	0·3	14·1	0·6
22	0 35·5	0 35·6	0 33·9	2·2	0·1	8·2	0·3	14·2	0·6
23	0 35·8	0 35·8	0 34·1	2·3	0·1	8·3	0·3	14·3	0·6
24	0 36·0	0 36·1	0 34·4	2·4	0·1	8·4	0·4	14·4	0·6
25	0 36·3	0 36·3	0 34·6	2·5	0·1	8·5	0·4	14·5	0·6
26	0 36·5	0 36·6	0 34·8	2·6	0·1	8·6	0·4	14·6	0·6
27	0 36·8	0 36·9	0 35·1	2·7	0·1	8·7	0·4	14·7	0·6
28	0 37·0	0 37·1	0 35·3	2·8	0·1	8·8	0·4	14·8	0·6
29	0 37·3	0 37·4	0 35·6	2·9	0·1	8·9	0·4	14·9	0·6
30	0 37·5	0 37·6	0 35·8	3·0	0·1	9·0	0·4	15·0	0·6
31	0 37·8	0 37·9	0 36·0	3·1	0·1	9·1	0·4	15·1	0·6
32	0 38·0	0 38·1	0 36·3	3·2	0·1	9·2	0·4	15·2	0·6
33	0 38·3	0 38·4	0 36·5	3·3	0·1	9·3	0·4	15·3	0·6
34	0 38·5	0 38·6	0 36·7	3·4	0·1	9·4	0·4	15·4	0·6
35	0 38·8	0 38·9	0 37·0	3·5	0·1	9·5	0·4	15·5	0·6
36	0 39·0	0 39·1	0 37·2	3·6	0·2	9·6	0·4	15·6	0·7
37	0 39·3	0 39·4	0 37·5	3·7	0·2	9·7	0·4	15·7	0·7
38	0 39·5	0 39·6	0 37·7	3·8	0·2	9·8	0·4	15·8	0·7
39	0 39·8	0 39·9	0 37·9	3·9	0·2	9·9	0·4	15·9	0·7
40	0 40·0	0 40·1	0 38·2	4·0	0·2	10·0	0·4	16·0	0·7
41	0 40·3	0 40·4	0 38·4	4·1	0·2	10·1	0·4	16·1	0·7
42	0 40·5	0 40·6	0 38·7	4·2	0·2	10·2	0·4	16·2	0·7
43	0 40·8	0 40·9	0 38·9	4·3	0·2	10·3	0·4	16·3	0·7
44	0 41·0	0 41·1	0 39·1	4·4	0·2	10·4	0·4	16·4	0·7
45	0 41·3	0 41·4	0 39·4	4·5	0·2	10·5	0·4	16·5	0·7
46	0 41·5	0 41·6	0 39·6	4·6	0·2	10·6	0·4	16·6	0·7
47	0 41·8	0 41·9	0 39·8	4·7	0·2	10·7	0·4	16·7	0·7
48	0 42·0	0 42·1	0 40·1	4·8	0·2	10·8	0·5	16·8	0·7
49	0 42·3	0 42·4	0 40·3	4·9	0·2	10·9	0·5	16·9	0·7
50	0 42·5	0 42·6	0 40·6	5·0	0·2	11·0	0·5	17·0	0·7
51	0 42·8	0 42·9	0 40·8	5·1	0·2	11·1	0·5	17·1	0·7
52	0 43·0	0 43·1	0 41·0	5·2	0·2	11·2	0·5	17·2	0·7
53	0 43·3	0 43·4	0 41·3	5·3	0·2	11·3	0·5	17·3	0·7
54	0 43·5	0 43·6	0 41·5	5·4	0·2	11·4	0·5	17·4	0·7
55	0 43·8	0 43·9	0 41·8	5·5	0·2	11·5	0·5	17·5	0·7
56	0 44·0	0 44·1	0 42·0	5·6	0·2	11·6	0·5	17·6	0·7
57	0 44·3	0 44·4	0 42·2	5·7	0·2	11·7	0·5	17·7	0·7
58	0 44·5	0 44·6	0 42·5	5·8	0·2	11·8	0·5	17·8	0·7
59	0 44·8	0 44·9	0 42·7	5·9	0·2	11·9	0·5	17·9	0·7
60	0 45·0	0 45·1	0 43·0	6·0	0·3	12·0	0·5	18·0	0·8

m 3	SUN PLANETS	ARIES	MOON	v or d	Corrⁿ	v or d	Corrⁿ	v or d	Corrⁿ
s	° ′	° ′	° ′	′	′	′	′	′	′
00	0 45·0	0 45·1	0 43·0	0·0	0·0	6·0	0·4	12·0	0·7
01	0 45·3	0 45·4	0 43·2	0·1	0·0	6·1	0·4	12·1	0·7
02	0 45·5	0 45·6	0 43·4	0·2	0·0	6·2	0·4	12·2	0·7
03	0 45·8	0 45·9	0 43·7	0·3	0·0	6·3	0·4	12·3	0·7
04	0 46·0	0 46·1	0 43·9	0·4	0·0	6·4	0·4	12·4	0·7
05	0 46·3	0 46·4	0 44·1	0·5	0·0	6·5	0·4	12·5	0·7
06	0 46·5	0 46·6	0 44·4	0·6	0·0	6·6	0·4	12·6	0·7
07	0 46·8	0 46·9	0 44·6	0·7	0·0	6·7	0·4	12·7	0·7
08	0 47·0	0 47·1	0 44·9	0·8	0·0	6·8	0·4	12·8	0·7
09	0 47·3	0 47·4	0 45·1	0·9	0·1	6·9	0·4	12·9	0·8
10	0 47·5	0 47·6	0 45·3	1·0	0·1	7·0	0·4	13·0	0·8
11	0 47·8	0 47·9	0 45·6	1·1	0·1	7·1	0·4	13·1	0·8
12	0 48·0	0 48·1	0 45·8	1·2	0·1	7·2	0·4	13·2	0·8
13	0 48·3	0 48·4	0 46·1	1·3	0·1	7·3	0·4	13·3	0·8
14	0 48·5	0 48·6	0 46·3	1·4	0·1	7·4	0·4	13·4	0·8
15	0 48·8	0 48·9	0 46·5	1·5	0·1	7·5	0·4	13·5	0·8
16	0 49·0	0 49·1	0 46·8	1·6	0·1	7·6	0·4	13·6	0·8
17	0 49·3	0 49·4	0 47·0	1·7	0·1	7·7	0·4	13·7	0·8
18	0 49·5	0 49·6	0 47·2	1·8	0·1	7·8	0·5	13·8	0·8
19	0 49·8	0 49·9	0 47·5	1·9	0·1	7·9	0·5	13·9	0·8
20	0 50·0	0 50·1	0 47·7	2·0	0·1	8·0	0·5	14·0	0·8
21	0 50·3	0 50·4	0 48·0	2·1	0·1	8·1	0·5	14·1	0·8
22	0 50·5	0 50·6	0 48·2	2·2	0·1	8·2	0·5	14·2	0·8
23	0 50·8	0 50·9	0 48·4	2·3	0·1	8·3	0·5	14·3	0·8
24	0 51·0	0 51·1	0 48·7	2·4	0·1	8·4	0·5	14·4	0·8
25	0 51·3	0 51·4	0 48·9	2·5	0·1	8·5	0·5	14·5	0·8
26	0 51·5	0 51·6	0 49·2	2·6	0·2	8·6	0·5	14·6	0·9
27	0 51·8	0 51·9	0 49·4	2·7	0·2	8·7	0·5	14·7	0·9
28	0 52·0	0 52·1	0 49·6	2·8	0·2	8·8	0·5	14·8	0·9
29	0 52·3	0 52·4	0 49·9	2·9	0·2	8·9	0·5	14·9	0·9
30	0 52·5	0 52·6	0 50·1	3·0	0·2	9·0	0·5	15·0	0·9
31	0 52·8	0 52·9	0 50·3	3·1	0·2	9·1	0·5	15·1	0·9
32	0 53·0	0 53·1	0 50·6	3·2	0·2	9·2	0·5	15·2	0·9
33	0 53·3	0 53·4	0 50·8	3·3	0·2	9·3	0·5	15·3	0·9
34	0 53·5	0 53·6	0 51·1	3·4	0·2	9·4	0·5	15·4	0·9
35	0 53·8	0 53·9	0 51·3	3·5	0·2	9·5	0·6	15·5	0·9
36	0 54·0	0 54·1	0 51·5	3·6	0·2	9·6	0·6	15·6	0·9
37	0 54·3	0 54·4	0 51·8	3·7	0·2	9·7	0·6	15·7	0·9
38	0 54·5	0 54·6	0 52·0	3·8	0·2	9·8	0·6	15·8	0·9
39	0 54·8	0 54·9	0 52·3	3·9	0·2	9·9	0·6	15·9	0·9
40	0 55·0	0 55·2	0 52·5	4·0	0·2	10·0	0·6	16·0	0·9
41	0 55·3	0 55·4	0 52·7	4·1	0·2	10·1	0·6	16·1	0·9
42	0 55·5	0 55·7	0 53·0	4·2	0·2	10·2	0·6	16·2	0·9
43	0 55·8	0 55·9	0 53·2	4·3	0·3	10·3	0·6	16·3	1·0
44	0 56·0	0 56·2	0 53·4	4·4	0·3	10·4	0·6	16·4	1·0
45	0 56·3	0 56·4	0 53·7	4·5	0·3	10·5	0·6	16·5	1·0
46	0 56·5	0 56·7	0 53·9	4·6	0·3	10·6	0·6	16·6	1·0
47	0 56·8	0 56·9	0 54·2	4·7	0·3	10·7	0·6	16·7	1·0
48	0 57·0	0 57·2	0 54·4	4·8	0·3	10·8	0·6	16·8	1·0
49	0 57·3	0 57·4	0 54·6	4·9	0·3	10·9	0·6	16·9	1·0
50	0 57·5	0 57·7	0 54·9	5·0	0·3	11·0	0·6	17·0	1·0
51	0 57·8	0 57·9	0 55·1	5·1	0·3	11·1	0·6	17·1	1·0
52	0 58·0	0 58·2	0 55·4	5·2	0·3	11·2	0·7	17·2	1·0
53	0 58·3	0 58·4	0 55·6	5·3	0·3	11·3	0·7	17·3	1·0
54	0 58·5	0 58·7	0 55·8	5·4	0·3	11·4	0·7	17·4	1·0
55	0 58·8	0 58·9	0 56·1	5·5	0·3	11·5	0·7	17·5	1·0
56	0 59·0	0 59·2	0 56·3	5·6	0·3	11·6	0·7	17·6	1·0
57	0 59·3	0 59·4	0 56·6	5·7	0·3	11·7	0·7	17·7	1·0
58	0 59·5	0 59·7	0 56·8	5·8	0·3	11·8	0·7	17·8	1·0
59	0 59·8	0 59·9	0 57·0	5·9	0·3	11·9	0·7	17·9	1·0
60	1 00·0	1 00·2	0 57·3	6·0	0·4	12·0	0·7	18·0	1·1

m 4	SUN PLANETS	ARIES	MOON	*v* or *d*	Corrⁿ	*v* or *d*	Corrⁿ	*v* or *d*	Corrⁿ
s	° ′	° ′	° ′	′	′	′	′	′	′
00	1 00·0	1 00·2	0 57·3	0·0	0·0	6·0	0·5	12·0	0·9
01	1 00·3	1 00·4	0 57·5	0·1	0·0	6·1	0·5	12·1	0·9
02	1 00·5	1 00·7	0 57·7	0·2	0·0	6·2	0·5	12·2	0·9
03	1 00·8	1 00·9	0 58·0	0·3	0·0	6·3	0·5	12·3	0·9
04	1 01·0	1 01·2	0 58·2	0·4	0·0	6·4	0·5	12·4	0·9
05	1 01·3	1 01·4	0 58·5	0·5	0·0	6·5	0·5	12·5	0·9
06	1 01·5	1 01·7	0 58·7	0·6	0·0	6·6	0·5	12·6	0·9
07	1 01·8	1 01·9	0 58·9	0·7	0·1	6·7	0·5	12·7	1·0
08	1 02·0	1 02·2	0 59·2	0·8	0·1	6·8	0·5	12·8	1·0
09	1 02·3	1 02·4	0 59·4	0·9	0·1	6·9	0·5	12·9	1·0
10	1 02·5	1 02·7	0 59·7	1·0	0·1	7·0	0·5	13·0	1·0
11	1 02·8	1 02·9	0 59·9	1·1	0·1	7·1	0·5	13·1	1·0
12	1 03·0	1 03·2	1 00·1	1·2	0·1	7·2	0·5	13·2	1·0
13	1 03·3	1 03·4	1 00·4	1·3	0·1	7·3	0·5	13·3	1·0
14	1 03·5	1 03·7	1 00·6	1·4	0·1	7·4	0·6	13·4	1·0
15	1 03·8	1 03·9	1 00·8	1·5	0·1	7·5	0·6	13·5	1·0
16	1 04·0	1 04·2	1 01·1	1·6	0·1	7·6	0·6	13·6	1·0
17	1 04·3	1 04·4	1 01·3	1·7	0·1	7·7	0·6	13·7	1·0
18	1 04·5	1 04·7	1 01·6	1·8	0·1	7·8	0·6	13·8	1·0
19	1 04·8	1 04·9	1 01·8	1·9	0·1	7·9	0·6	13·9	1·0
20	1 05·0	1 05·2	1 02·0	2·0	0·2	8·0	0·6	14·0	1·1
21	1 05·3	1 05·4	1 02·3	2·1	0·2	8·1	0·6	14·1	1·1
22	1 05·5	1 05·7	1 02·5	2·2	0·2	8·2	0·6	14·2	1·1
23	1 05·8	1 05·9	1 02·8	2·3	0·2	8·3	0·6	14·3	1·1
24	1 06·0	1 06·2	1 03·0	2·4	0·2	8·4	0·6	14·4	1·1
25	1 06·3	1 06·4	1 03·2	2·5	0·2	8·5	0·6	14·5	1·1
26	1 06·5	1 06·7	1 03·5	2·6	0·2	8·6	0·6	14·6	1·1
27	1 06·8	1 06·9	1 03·7	2·7	0·2	8·7	0·7	14·7	1·1
28	1 07·0	1 07·2	1 03·9	2·8	0·2	8·8	0·7	14·8	1·1
29	1 07·3	1 07·4	1 04·2	2·9	0·2	8·9	0·7	14·9	1·1
30	1 07·5	1 07·7	1 04·4	3·0	0·2	9·0	0·7	15·0	1·1
31	1 07·8	1 07·9	1 04·7	3·1	0·2	9·1	0·7	15·1	1·1
32	1 08·0	1 08·2	1 04·9	3·2	0·2	9·2	0·7	15·2	1·1
33	1 08·3	1 08·4	1 05·1	3·3	0·2	9·3	0·7	15·3	1·1
34	1 08·5	1 08·7	1 05·4	3·4	0·3	9·4	0·7	15·4	1·2
35	1 08·8	1 08·9	1 05·6	3·5	0·3	9·5	0·7	15·5	1·2
36	1 09·0	1 09·2	1 05·9	3·6	0·3	9·6	0·7	15·6	1·2
37	1 09·3	1 09·4	1 06·1	3·7	0·3	9·7	0·7	15·7	1·2
38	1 09·5	1 09·7	1 06·3	3·8	0·3	9·8	0·7	15·8	1·2
39	1 09·8	1 09·9	1 06·6	3·9	0·3	9·9	0·7	15·9	1·2
40	1 10·0	1 10·2	1 06·8	4·0	0·3	10·0	0·8	16·0	1·2
41	1 10·3	1 10·4	1 07·0	4·1	0·3	10·1	0·8	16·1	1·2
42	1 10·5	1 10·7	1 07·3	4·2	0·3	10·2	0·8	16·2	1·2
43	1 10·8	1 10·9	1 07·5	4·3	0·3	10·3	0·8	16·3	1·2
44	1 11·0	1 11·2	1 07·8	4·4	0·3	10·4	0·8	16·4	1·2
45	1 11·3	1 11·4	1 08·0	4·5	0·3	10·5	0·8	16·5	1·2
46	1 11·5	1 11·7	1 08·2	4·6	0·3	10·6	0·8	16·6	1·2
47	1 11·8	1 11·9	1 08·5	4·7	0·4	10·7	0·8	16·7	1·3
48	1 12·0	1 12·2	1 08·7	4·8	0·4	10·8	0·8	16·8	1·3
49	1 12·3	1 12·4	1 09·0	4·9	0·4	10·9	0·8	16·9	1·3
50	1 12·5	1 12·7	1 09·2	5·0	0·4	11·0	0·8	17·0	1·3
51	1 12·8	1 12·9	1 09·4	5·1	0·4	11·1	0·8	17·1	1·3
52	1 13·0	1 13·2	1 09·7	5·2	0·4	11·2	0·8	17·2	1·3
53	1 13·3	1 13·5	1 09·9	5·3	0·4	11·3	0·8	17·3	1·3
54	1 13·5	1 13·7	1 10·2	5·4	0·4	11·4	0·9	17·4	1·3
55	1 13·8	1 14·0	1 10·4	5·5	0·4	11·5	0·9	17·5	1·3
56	1 14·0	1 14·2	1 10·6	5·6	0·4	11·6	0·9	17·6	1·3
57	1 14·3	1 14·5	1 10·9	5·7	0·4	11·7	0·9	17·7	1·3
58	1 14·5	1 14·7	1 11·1	5·8	0·4	11·8	0·9	17·8	1·3
59	1 14·8	1 15·0	1 11·3	5·9	0·4	11·9	0·9	17·9	1·3
60	1 15·0	1 15·2	1 11·6	6·0	0·5	12·0	0·9	18·0	1·4

m 5	SUN PLANETS	ARIES	MOON	*v* or *d*	Corrⁿ	*v* or *d*	Corrⁿ	*v* or *d*	Corrⁿ
s	° ′	° ′	° ′	′	′	′	′	′	′
00	1 15·0	1 15·2	1 11·6	0·0	0·0	6·0	0·6	12·0	1·1
01	1 15·3	1 15·5	1 11·8	0·1	0·0	6·1	0·6	12·1	1·1
02	1 15·5	1 15·7	1 12·1	0·2	0·0	6·2	0·6	12·2	1·1
03	1 15·8	1 16·0	1 12·3	0·3	0·0	6·3	0·6	12·3	1·1
04	1 16·0	1 16·2	1 12·5	0·4	0·0	6·4	0·6	12·4	1·1
05	1 16·3	1 16·5	1 12·8	0·5	0·0	6·5	0·6	12·5	1·1
06	1 16·5	1 16·7	1 13·0	0·6	0·1	6·6	0·6	12·6	1·2
07	1 16·8	1 17·0	1 13·3	0·7	0·1	6·7	0·6	12·7	1·2
08	1 17·0	1 17·2	1 13·5	0·8	0·1	6·8	0·6	12·8	1·2
09	1 17·3	1 17·5	1 13·7	0·9	0·1	6·9	0·6	12·9	1·2
10	1 17·5	1 17·7	1 14·0	1·0	0·1	7·0	0·6	13·0	1·2
11	1 17·8	1 18·0	1 14·2	1·1	0·1	7·1	0·7	13·1	1·2
12	1 18·0	1 18·2	1 14·4	1·2	0·1	7·2	0·7	13·2	1·2
13	1 18·3	1 18·5	1 14·7	1·3	0·1	7·3	0·7	13·3	1·2
14	1 18·5	1 18·7	1 14·9	1·4	0·1	7·4	0·7	13·4	1·2
15	1 18·8	1 19·0	1 15·2	1·5	0·1	7·5	0·7	13·5	1·2
16	1 19·0	1 19·2	1 15·4	1·6	0·1	7·6	0·7	13·6	1·2
17	1 19·3	1 19·5	1 15·6	1·7	0·2	7·7	0·7	13·7	1·3
18	1 19·5	1 19·7	1 15·9	1·8	0·2	7·8	0·7	13·8	1·3
19	1 19·8	1 20·0	1 16·1	1·9	0·2	7·9	0·7	13·9	1·3
20	1 20·0	1 20·2	1 16·4	2·0	0·2	8·0	0·7	14·0	1·3
21	1 20·3	1 20·5	1 16·6	2·1	0·2	8·1	0·7	14·1	1·3
22	1 20·5	1 20·7	1 16·8	2·2	0·2	8·2	0·8	14·2	1·3
23	1 20·8	1 21·0	1 17·1	2·3	0·2	8·3	0·8	14·3	1·3
24	1 21·0	1 21·2	1 17·3	2·4	0·2	8·4	0·8	14·4	1·3
25	1 21·3	1 21·5	1 17·5	2·5	0·2	8·5	0·8	14·5	1·3
26	1 21·5	1 21·7	1 17·8	2·6	0·2	8·6	0·8	14·6	1·3
27	1 21·8	1 22·0	1 18·0	2·7	0·2	8·7	0·8	14·7	1·3
28	1 22·0	1 22·2	1 18·3	2·8	0·3	8·8	0·8	14·8	1·4
29	1 22·3	1 22·5	1 18·5	2·9	0·3	8·9	0·8	14·9	1·4
30	1 22·5	1 22·7	1 18·7	3·0	0·3	9·0	0·8	15·0	1·4
31	1 22·8	1 23·0	1 19·0	3·1	0·3	9·1	0·8	15·1	1·4
32	1 23·0	1 23·2	1 19·2	3·2	0·3	9·2	0·8	15·2	1·4
33	1 23·3	1 23·5	1 19·5	3·3	0·3	9·3	0·9	15·3	1·4
34	1 23·5	1 23·7	1 19·7	3·4	0·3	9·4	0·9	15·4	1·4
35	1 23·8	1 24·0	1 19·9	3·5	0·3	9·5	0·9	15·5	1·4
36	1 24·0	1 24·2	1 20·2	3·6	0·3	9·6	0·9	15·6	1·4
37	1 24·3	1 24·5	1 20·4	3·7	0·3	9·7	0·9	15·7	1·4
38	1 24·5	1 24·7	1 20·7	3·8	0·3	9·8	0·9	15·8	1·4
39	1 24·8	1 25·0	1 20·9	3·9	0·4	9·9	0·9	15·9	1·5
40	1 25·0	1 25·2	1 21·1	4·0	0·4	10·0	0·9	16·0	1·5
41	1 25·3	1 25·5	1 21·4	4·1	0·4	10·1	0·9	16·1	1·5
42	1 25·5	1 25·7	1 21·6	4·2	0·4	10·2	0·9	16·2	1·5
43	1 25·8	1 26·0	1 21·8	4·3	0·4	10·3	0·9	16·3	1·5
44	1 26·0	1 26·2	1 22·1	4·4	0·4	10·4	1·0	16·4	1·5
45	1 26·3	1 26·5	1 22·3	4·5	0·4	10·5	1·0	16·5	1·5
46	1 26·5	1 26·7	1 22·6	4·6	0·4	10·6	1·0	16·6	1·5
47	1 26·8	1 27·0	1 22·8	4·7	0·4	10·7	1·0	16·7	1·5
48	1 27·0	1 27·2	1 23·0	4·8	0·4	10·8	1·0	16·8	1·5
49	1 27·3	1 27·5	1 23·3	4·9	0·4	10·9	1·0	16·9	1·5
50	1 27·5	1 27·7	1 23·5	5·0	0·5	11·0	1·0	17·0	1·6
51	1 27·8	1 28·0	1 23·8	5·1	0·5	11·1	1·0	17·1	1·6
52	1 28·0	1 28·2	1 24·0	5·2	0·5	11·2	1·0	17·2	1·6
53	1 28·3	1 28·5	1 24·2	5·3	0·5	11·3	1·0	17·3	1·6
54	1 28·5	1 28·7	1 24·5	5·4	0·5	11·4	1·0	17·4	1·6
55	1 28·8	1 29·0	1 24·7	5·5	0·5	11·5	1·1	17·5	1·6
56	1 29·0	1 29·2	1 24·9	5·6	0·5	11·6	1·1	17·6	1·6
57	1 29·3	1 29·5	1 25·2	5·7	0·5	11·7	1·1	17·7	1·6
58	1 29·5	1 29·7	1 25·4	5·8	0·5	11·8	1·1	17·8	1·6
59	1 29·8	1 30·0	1 25·7	5·9	0·5	11·9	1·1	17·9	1·6
60	1 30·0	1 30·2	1 25·9	6·0	0·6	12·0	1·1	18·0	1·7

m 6	SUN PLANETS	ARIES	MOON	v or d	Corrⁿ	v or d	Corrⁿ	v or d	Corrⁿ
s	° ′	° ′	° ′	′	′	′	′	′	′
00	1 30·0	1 30·2	1 25·9	0·0	0·0	6·0	0·7	12·0	1·3
01	1 30·3	1 30·5	1 26·1	0·1	0·0	6·1	0·7	12·1	1·3
02	1 30·5	1 30·7	1 26·4	0·2	0·0	6·2	0·7	12·2	1·3
03	1 30·8	1 31·0	1 26·6	0·3	0·0	6·3	0·7	12·3	1·3
04	1 31·0	1 31·2	1 26·9	0·4	0·0	6·4	0·7	12·4	1·3
05	1 31·3	1 31·5	1 27·1	0·5	0·1	6·5	0·7	12·5	1·4
06	1 31·5	1 31·8	1 27·3	0·6	0·1	6·6	0·7	12·6	1·4
07	1 31·8	1 32·0	1 27·6	0·7	0·1	6·7	0·7	12·7	1·4
08	1 32·0	1 32·3	1 27·8	0·8	0·1	6·8	0·7	12·8	1·4
09	1 32·3	1 32·5	1 28·0	0·9	0·1	6·9	0·7	12·9	1·4
10	1 32·5	1 32·8	1 28·3	1·0	0·1	7·0	0·8	13·0	1·4
11	1 32·8	1 33·0	1 28·5	1·1	0·1	7·1	0·8	13·1	1·4
12	1 33·0	1 33·3	1 28·8	1·2	0·1	7·2	0·8	13·2	1·4
13	1 33·3	1 33·5	1 29·0	1·3	0·1	7·3	0·8	13·3	1·4
14	1 33·5	1 33·8	1 29·2	1·4	0·2	7·4	0·8	13·4	1·5
15	1 33·8	1 34·0	1 29·5	1·5	0·2	7·5	0·8	13·5	1·5
16	1 34·0	1 34·3	1 29·7	1·6	0·2	7·6	0·8	13·6	1·5
17	1 34·3	1 34·5	1 30·0	1·7	0·2	7·7	0·8	13·7	1·5
18	1 34·5	1 34·8	1 30·2	1·8	0·2	7·8	0·8	13·8	1·5
19	1 34·8	1 35·0	1 30·4	1·9	0·2	7·9	0·9	13·9	1·5
20	1 35·0	1 35·3	1 30·7	2·0	0·2	8·0	0·9	14·0	1·5
21	1 35·3	1 35·5	1 30·9	2·1	0·2	8·1	0·9	14·1	1·5
22	1 35·5	1 35·8	1 31·1	2·2	0·2	8·2	0·9	14·2	1·5
23	1 35·8	1 36·0	1 31·4	2·3	0·2	8·3	0·9	14·3	1·5
24	1 36·0	1 36·3	1 31·6	2·4	0·3	8·4	0·9	14·4	1·6
25	1 36·3	1 36·5	1 31·9	2·5	0·3	8·5	0·9	14·5	1·6
26	1 36·5	1 36·8	1 32·1	2·6	0·3	8·6	0·9	14·6	1·6
27	1 36·8	1 37·0	1 32·3	2·7	0·3	8·7	0·9	14·7	1·6
28	1 37·0	1 37·3	1 32·6	2·8	0·3	8·8	1·0	14·8	1·6
29	1 37·3	1 37·5	1 32·8	2·9	0·3	8·9	1·0	14·9	1·6
30	1 37·5	1 37·8	1 33·1	3·0	0·3	9·0	1·0	15·0	1·6
31	1 37·8	1 38·0	1 33·3	3·1	0·3	9·1	1·0	15·1	1·6
32	1 38·0	1 38·3	1 33·5	3·2	0·3	9·2	1·0	15·2	1·6
33	1 38·3	1 38·5	1 33·8	3·3	0·4	9·3	1·0	15·3	1·7
34	1 38·5	1 38·8	1 34·0	3·4	0·4	9·4	1·0	15·4	1·7
35	1 38·8	1 39·0	1 34·3	3·5	0·4	9·5	1·0	15·5	1·7
36	1 39·0	1 39·3	1 34·5	3·6	0·4	9·6	1·0	15·6	1·7
37	1 39·3	1 39·5	1 34·7	3·7	0·4	9·7	1·1	15·7	1·7
38	1 39·5	1 39·8	1 35·0	3·8	0·4	9·8	1·1	15·8	1·7
39	1 39·8	1 40·0	1 35·2	3·9	0·4	9·9	1·1	15·9	1·7
40	1 40·0	1 40·3	1 35·4	4·0	0·4	10·0	1·1	16·0	1·7
41	1 40·3	1 40·5	1 35·7	4·1	0·4	10·1	1·1	16·1	1·7
42	1 40·5	1 40·8	1 35·9	4·2	0·5	10·2	1·1	16·2	1·8
43	1 40·8	1 41·0	1 36·2	4·3	0·5	10·3	1·1	16·3	1·8
44	1 41·0	1 41·3	1 36·4	4·4	0·5	10·4	1·1	16·4	1·8
45	1 41·3	1 41·5	1 36·6	4·5	0·5	10·5	1·1	16·5	1·8
46	1 41·5	1 41·8	1 36·9	4·6	0·5	10·6	1·1	16·6	1·8
47	1 41·8	1 42·0	1 37·1	4·7	0·5	10·7	1·2	16·7	1·8
48	1 42·0	1 42·3	1 37·4	4·8	0·5	10·8	1·2	16·8	1·8
49	1 42·3	1 42·5	1 37·6	4·9	0·5	10·9	1·2	16·9	1·8
50	1 42·5	1 42·8	1 37·8	5·0	0·5	11·0	1·2	17·0	1·8
51	1 42·8	1 43·0	1 38·1	5·1	0·6	11·1	1·2	17·1	1·9
52	1 43·0	1 43·3	1 38·3	5·2	0·6	11·2	1·2	17·2	1·9
53	1 43·3	1 43·5	1 38·5	5·3	0·6	11·3	1·2	17·3	1·9
54	1 43·5	1 43·8	1 38·8	5·4	0·6	11·4	1·2	17·4	1·9
55	1 43·8	1 44·0	1 39·0	5·5	0·6	11·5	1·2	17·5	1·9
56	1 44·0	1 44·3	1 39·3	5·6	0·6	11·6	1·3	17·6	1·9
57	1 44·3	1 44·5	1 39·5	5·7	0·6	11·7	1·3	17·7	1·9
58	1 44·5	1 44·8	1 39·7	5·8	0·6	11·8	1·3	17·8	1·9
59	1 44·8	1 45·0	1 40·0	5·9	0·6	11·9	1·3	17·9	1·9
60	1 45·0	1 45·3	1 40·2	6·0	0·7	12·0	1·3	18·0	2·0

m 7	SUN PLANETS	ARIES	MOON	v or d	Corrⁿ	v or d	Corrⁿ	v or d	Corrⁿ
s	° ′	° ′	° ′	′	′	′	′	′	′
00	1 45·0	1 45·3	1 40·2	0·0	0·0	6·0	0·8	12·0	1·5
01	1 45·3	1 45·5	1 40·5	0·1	0·0	6·1	0·8	12·1	1·5
02	1 45·5	1 45·8	1 40·7	0·2	0·0	6·2	0·8	12·2	1·5
03	1 45·8	1 46·0	1 40·9	0·3	0·0	6·3	0·8	12·3	1·5
04	1 46·0	1 46·3	1 41·2	0·4	0·1	6·4	0·8	12·4	1·6
05	1 46·3	1 46·5	1 41·4	0·5	0·1	6·5	0·8	12·5	1·6
06	1 46·5	1 46·8	1 41·6	0·6	0·1	6·6	0·8	12·6	1·6
07	1 46·8	1 47·0	1 41·9	0·7	0·1	6·7	0·8	12·7	1·6
08	1 47·0	1 47·3	1 42·1	0·8	0·1	6·8	0·9	12·8	1·6
09	1 47·3	1 47·5	1 42·4	0·9	0·1	6·9	0·9	12·9	1·6
10	1 47·5	1 47·8	1 42·6	1·0	0·1	7·0	0·9	13·0	1·6
11	1 47·8	1 48·0	1 42·8	1·1	0·1	7·1	0·9	13·1	1·6
12	1 48·0	1 48·3	1 43·1	1·2	0·2	7·2	0·9	13·2	1·7
13	1 48·3	1 48·5	1 43·3	1·3	0·2	7·3	0·9	13·3	1·7
14	1 48·5	1 48·8	1 43·6	1·4	0·2	7·4	0·9	13·4	1·7
15	1 48·8	1 49·0	1 43·8	1·5	0·2	7·5	0·9	13·5	1·7
16	1 49·0	1 49·3	1 44·0	1·6	0·2	7·6	1·0	13·6	1·7
17	1 49·3	1 49·5	1 44·3	1·7	0·2	7·7	1·0	13·7	1·7
18	1 49·5	1 49·8	1 44·5	1·8	0·2	7·8	1·0	13·8	1·7
19	1 49·8	1 50·1	1 44·8	1·9	0·2	7·9	1·0	13·9	1·7
20	1 50·0	1 50·3	1 45·0	2·0	0·3	8·0	1·0	14·0	1·8
21	1 50·3	1 50·6	1 45·2	2·1	0·3	8·1	1·0	14·1	1·8
22	1 50·5	1 50·8	1 45·5	2·2	0·3	8·2	1·0	14·2	1·8
23	1 50·8	1 51·1	1 45·7	2·3	0·3	8·3	1·0	14·3	1·8
24	1 51·0	1 51·3	1 45·9	2·4	0·3	8·4	1·1	14·4	1·8
25	1 51·3	1 51·6	1 46·2	2·5	0·3	8·5	1·1	14·5	1·8
26	1 51·5	1 51·8	1 46·4	2·6	0·3	8·6	1·1	14·6	1·8
27	1 51·8	1 52·1	1 46·7	2·7	0·3	8·7	1·1	14·7	1·8
28	1 52·0	1 52·3	1 46·9	2·8	0·4	8·8	1·1	14·8	1·9
29	1 52·3	1 52·6	1 47·1	2·9	0·4	8·9	1·1	14·9	1·9
30	1 52·5	1 52·8	1 47·4	3·0	0·4	9·0	1·1	15·0	1·9
31	1 52·8	1 53·1	1 47·6	3·1	0·4	9·1	1·1	15·1	1·9
32	1 53·0	1 53·3	1 47·9	3·2	0·4	9·2	1·2	15·2	1·9
33	1 53·3	1 53·6	1 48·1	3·3	0·4	9·3	1·2	15·3	1·9
34	1 53·5	1 53·8	1 48·3	3·4	0·4	9·4	1·2	15·4	1·9
35	1 53·8	1 54·1	1 48·6	3·5	0·4	9·5	1·2	15·5	1·9
36	1 54·0	1 54·3	1 48·8	3·6	0·5	9·6	1·2	15·6	2·0
37	1 54·3	1 54·6	1 49·0	3·7	0·5	9·7	1·2	15·7	2·0
38	1 54·5	1 54·8	1 49·3	3·8	0·5	9·8	1·2	15·8	2·0
39	1 54·8	1 55·1	1 49·5	3·9	0·5	9·9	1·2	15·9	2·0
40	1 55·0	1 55·3	1 49·8	4·0	0·5	10·0	1·3	16·0	2·0
41	1 55·3	1 55·6	1 50·0	4·1	0·5	10·1	1·3	16·1	2·0
42	1 55·5	1 55·8	1 50·2	4·2	0·5	10·2	1·3	16·2	2·0
43	1 55·8	1 56·1	1 50·5	4·3	0·5	10·3	1·3	16·3	2·0
44	1 56·0	1 56·3	1 50·7	4·4	0·6	10·4	1·3	16·4	2·1
45	1 56·3	1 56·6	1 51·0	4·5	0·6	10·5	1·3	16·5	2·1
46	1 56·5	1 56·8	1 51·2	4·6	0·6	10·6	1·3	16·6	2·1
47	1 56·8	1 57·1	1 51·4	4·7	0·6	10·7	1·3	16·7	2·1
48	1 57·0	1 57·3	1 51·7	4·8	0·6	10·8	1·4	16·8	2·1
49	1 57·3	1 57·6	1 51·9	4·9	0·6	10·9	1·4	16·9	2·1
50	1 57·5	1 57·8	1 52·1	5·0	0·6	11·0	1·4	17·0	2·1
51	1 57·8	1 58·1	1 52·4	5·1	0·6	11·1	1·4	17·1	2·1
52	1 58·0	1 58·3	1 52·6	5·2	0·7	11·2	1·4	17·2	2·2
53	1 58·3	1 58·6	1 52·9	5·3	0·7	11·3	1·4	17·3	2·2
54	1 58·5	1 58·8	1 53·1	5·4	0·7	11·4	1·4	17·4	2·2
55	1 58·8	1 59·1	1 53·3	5·5	0·7	11·5	1·4	17·5	2·2
56	1 59·0	1 59·3	1 53·6	5·6	0·7	11·6	1·5	17·6	2·2
57	1 59·3	1 59·6	1 53·8	5·7	0·7	11·7	1·5	17·7	2·2
58	1 59·5	1 59·8	1 54·1	5·8	0·7	11·8	1·5	17·8	2·2
59	1 59·8	2 00·1	1 54·3	5·9	0·7	11·9	1·5	17·9	2·2
60	2 00·0	2 00·3	1 54·5	6·0	0·8	12·0	1·5	18·0	2·3

m 8	SUN PLANETS	ARIES	MOON	*v* or *d*	Corr^{n}	*v* or *d*	Corr^{n}	*v* or *d*	Corr^{n}
s	° ′	° ′	° ′	′	′	′	′	′	′
00	2 00·0	2 00·3	1 54·5	0·0	0·0	6·0	0·9	12·0	1·7
01	2 00·3	2 00·6	1 54·8	0·1	0·0	6·1	0·9	12·1	1·7
02	2 00·5	2 00·8	1 55·0	0·2	0·0	6·2	0·9	12·2	1·7
03	2 00·8	2 01·1	1 55·2	0·3	0·0	6·3	0·9	12·3	1·7
04	2 01·0	2 01·3	1 55·5	0·4	0·1	6·4	0·9	12·4	1·8
05	2 01·3	2 01·6	1 55·7	0·5	0·1	6·5	0·9	12·5	1·8
06	2 01·5	2 01·8	1 56·0	0·6	0·1	6·6	0·9	12·6	1·8
07	2 01·8	2 02·1	1 56·2	0·7	0·1	6·7	0·9	12·7	1·8
08	2 02·0	2 02·3	1 56·4	0·8	0·1	6·8	1·0	12·8	1·8
09	2 02·3	2 02·6	1 56·7	0·9	0·1	6·9	1·0	12·9	1·8
10	2 02·5	2 02·8	1 56·9	1·0	0·1	7·0	1·0	13·0	1·8
11	2 02·8	2 03·1	1 57·2	1·1	0·2	7·1	1·0	13·1	1·9
12	2 03·0	2 03·3	1 57·4	1·2	0·2	7·2	1·0	13·2	1·9
13	2 03·3	2 03·6	1 57·6	1·3	0·2	7·3	1·0	13·3	1·9
14	2 03·5	2 03·8	1 57·9	1·4	0·2	7·4	1·0	13·4	1·9
15	2 03·8	2 04·1	1 58·1	1·5	0·2	7·5	1·1	13·5	1·9
16	2 04·0	2 04·3	1 58·4	1·6	0·2	7·6	1·1	13·6	1·9
17	2 04·3	2 04·6	1 58·6	1·7	0·2	7·7	1·1	13·7	1·9
18	2 04·5	2 04·8	1 58·8	1·8	0·3	7·8	1·1	13·8	2·0
19	2 04·8	2 05·1	1 59·1	1·9	0·3	7·9	1·1	13·9	2·0
20	2 05·0	2 05·3	1 59·3	2·0	0·3	8·0	1·1	14·0	2·0
21	2 05·3	2 05·6	1 59·5	2·1	0·3	8·1	1·1	14·1	2·0
22	2 05·5	2 05·8	1 59·8	2·2	0·3	8·2	1·2	14·2	2·0
23	2 05·8	2 06·1	2 00·0	2·3	0·3	8·3	1·2	14·3	2·0
24	2 06·0	2 06·3	2 00·3	2·4	0·3	8·4	1·2	14·4	2·0
25	2 06·3	2 06·6	2 00·5	2·5	0·4	8·5	1·2	14·5	2·1
26	2 06·5	2 06·8	2 00·7	2·6	0·4	8·6	1·2	14·6	2·1
27	2 06·8	2 07·1	2 01·0	2·7	0·4	8·7	1·2	14·7	2·1
28	2 07·0	2 07·3	2 01·2	2·8	0·4	8·8	1·2	14·8	2·1
29	2 07·3	2 07·6	2 01·5	2·9	0·4	8·9	1·3	14·9	2·1
30	2 07·5	2 07·8	2 01·7	3·0	0·4	9·0	1·3	15·0	2·1
31	2 07·8	2 08·1	2 01·9	3·1	0·4	9·1	1·3	15·1	2·1
32	2 08·0	2 08·4	2 02·2	3·2	0·5	9·2	1·3	15·2	2·2
33	2 08·3	2 08·6	2 02·4	3·3	0·5	9·3	1·3	15·3	2·2
34	2 08·5	2 08·9	2 02·6	3·4	0·5	9·4	1·3	15·4	2·2
35	2 08·8	2 09·1	2 02·9	3·5	0·5	9·5	1·3	15·5	2·2
36	2 09·0	2 09·4	2 03·1	3·6	0·5	9·6	1·4	15·6	2·2
37	2 09·3	2 09·6	2 03·4	3·7	0·5	9·7	1·4	15·7	2·2
38	2 09·5	2 09·9	2 03·6	3·8	0·5	9·8	1·4	15·8	2·2
39	2 09·8	2 10·1	2 03·8	3·9	0·6	9·9	1·4	15·9	2·3
40	2 10·0	2 10·4	2 04·1	4·0	0·6	10·0	1·4	16·0	2·3
41	2 10·3	2 10·6	2 04·3	4·1	0·6	10·1	1·4	16·1	2·3
42	2 10·5	2 10·9	2 04·6	4·2	0·6	10·2	1·4	16·2	2·3
43	2 10·8	2 11·1	2 04·8	4·3	0·6	10·3	1·5	16·3	2·3
44	2 11·0	2 11·4	2 05·0	4·4	0·6	10·4	1·5	16·4	2·3
45	2 11·3	2 11·6	2 05·3	4·5	0·6	10·5	1·5	16·5	2·3
46	2 11·5	2 11·9	2 05·5	4·6	0·7	10·6	1·5	16·6	2·4
47	2 11·8	2 12·1	2 05·7	4·7	0·7	10·7	1·5	16·7	2·4
48	2 12·0	2 12·4	2 06·0	4·8	0·7	10·8	1·5	16·8	2·4
49	2 12·3	2 12·6	2 06·2	4·9	0·7	10·9	1·5	16·9	2·4
50	2 12·5	2 12·9	2 06·5	5·0	0·7	11·0	1·6	17·0	2·4
51	2 12·8	2 13·1	2 06·7	5·1	0·7	11·1	1·6	17·1	2·4
52	2 13·0	2 13·4	2 06·9	5·2	0·7	11·2	1·6	17·2	2·4
53	2 13·3	2 13·6	2 07·2	5·3	0·8	11·3	1·6	17·3	2·5
54	2 13·5	2 13·9	2 07·4	5·4	0·8	11·4	1·6	17·4	2·5
55	2 13·8	2 14·1	2 07·7	5·5	0·8	11·5	1·6	17·5	2·5
56	2 14·0	2 14·4	2 07·9	5·6	0·8	11·6	1·6	17·6	2·5
57	2 14·3	2 14·6	2 08·1	5·7	0·8	11·7	1·7	17·7	2·5
58	2 14·5	2 14·9	2 08·4	5·8	0·8	11·8	1·7	17·8	2·5
59	2 14·8	2 15·1	2 08·6	5·9	0·8	11·9	1·7	17·9	2·5
60	2 15·0	2 15·4	2 08·9	6·0	0·9	12·0	1·7	18·0	2·6

m 9	SUN PLANETS	ARIES	MOON	*v* or *d*	Corr^{n}	*v* or *d*	Corr^{n}	*v* or *d*	Corr^{n}
s	° ′	° ′	° ′	′	′	′	′	′	′
00	2 15·0	2 15·4	2 08·9	0·0	0·0	6·0	1·0	12·0	1·9
01	2 15·3	2 15·6	2 09·1	0·1	0·0	6·1	1·0	12·1	1·9
02	2 15·5	2 15·9	2 09·3	0·2	0·0	6·2	1·0	12·2	1·9
03	2 15·8	2 16·1	2 09·6	0·3	0·0	6·3	1·0	12·3	1·9
04	2 16·0	2 16·4	2 09·8	0·4	0·1	6·4	1·0	12·4	2·0
05	2 16·3	2 16·6	2 10·0	0·5	0·1	6·5	1·0	12·5	2·0
06	2 16·5	2 16·9	2 10·3	0·6	0·1	6·6	1·0	12·6	2·0
07	2 16·8	2 17·1	2 10·5	0·7	0·1	6·7	1·1	12·7	2·0
08	2 17·0	2 17·4	2 10·8	0·8	0·1	6·8	1·1	12·8	2·0
09	2 17·3	2 17·6	2 11·0	0·9	0·1	6·9	1·1	12·9	2·0
10	2 17·5	2 17·9	2 11·2	1·0	0·2	7·0	1·1	13·0	2·1
11	2 17·8	2 18·1	2 11·5	1·1	0·2	7·1	1·1	13·1	2·1
12	2 18·0	2 18·4	2 11·7	1·2	0·2	7·2	1·1	13·2	2·1
13	2 18·3	2 18·6	2 12·0	1·3	0·2	7·3	1·2	13·3	2·1
14	2 18·5	2 18·9	2 12·2	1·4	0·2	7·4	1·2	13·4	2·1
15	2 18·8	2 19·1	2 12·4	1·5	0·2	7·5	1·2	13·5	2·1
16	2 19·0	2 19·4	2 12·7	1·6	0·3	7·6	1·2	13·6	2·2
17	2 19·3	2 19·6	2 12·9	1·7	0·3	7·7	1·2	13·7	2·2
18	2 19·5	2 19·9	2 13·1	1·8	0·3	7·8	1·2	13·8	2·2
19	2 19·8	2 20·1	2 13·4	1·9	0·3	7·9	1·3	13·9	2·2
20	2 20·0	2 20·4	2 13·6	2·0	0·3	8·0	1·3	14·0	2·2
21	2 20·3	2 20·6	2 13·9	2·1	0·3	8·1	1·3	14·1	2·2
22	2 20·5	2 20·9	2 14·1	2·2	0·3	8·2	1·3	14·2	2·2
23	2 20·8	2 21·1	2 14·3	2·3	0·4	8·3	1·3	14·3	2·3
24	2 21·0	2 21·4	2 14·6	2·4	0·4	8·4	1·3	14·4	2·3
25	2 21·3	2 21·6	2 14·8	2·5	0·4	8·5	1·3	14·5	2·3
26	2 21·5	2 21·9	2 15·1	2·6	0·4	8·6	1·4	14·6	2·3
27	2 21·8	2 22·1	2 15·3	2·7	0·4	8·7	1·4	14·7	2·3
28	2 22·0	2 22·4	2 15·5	2·8	0·4	8·8	1·4	14·8	2·3
29	2 22·3	2 22·6	2 15·8	2·9	0·5	8·9	1·4	14·9	2·4
30	2 22·5	2 22·9	2 16·0	3·0	0·5	9·0	1·4	15·0	2·4
31	2 22·8	2 23·1	2 16·2	3·1	0·5	9·1	1·4	15·1	2·4
32	2 23·0	2 23·4	2 16·5	3·2	0·5	9·2	1·5	15·2	2·4
33	2 23·3	2 23·6	2 16·7	3·3	0·5	9·3	1·5	15·3	2·4
34	2 23·5	2 23·9	2 17·0	3·4	0·5	9·4	1·5	15·4	2·4
35	2 23·8	2 24·1	2 17·2	3·5	0·6	9·5	1·5	15·5	2·5
36	2 24·0	2 24·4	2 17·4	3·6	0·6	9·6	1·5	15·6	2·5
37	2 24·3	2 24·6	2 17·7	3·7	0·6	9·7	1·5	15·7	2·5
38	2 24·5	2 24·9	2 17·9	3·8	0·6	9·8	1·6	15·8	2·5
39	2 24·8	2 25·1	2 18·2	3·9	0·6	9·9	1·6	15·9	2·5
40	2 25·0	2 25·4	2 18·4	4·0	0·6	10·0	1·6	16·0	2·5
41	2 25·3	2 25·6	2 18·6	4·1	0·6	10·1	1·6	16·1	2·5
42	2 25·5	2 25·9	2 18·9	4·2	0·7	10·2	1·6	16·2	2·6
43	2 25·8	2 26·1	2 19·1	4·3	0·7	10·3	1·6	16·3	2·6
44	2 26·0	2 26·4	2 19·3	4·4	0·7	10·4	1·6	16·4	2·6
45	2 26·3	2 26·7	2 19·6	4·5	0·7	10·5	1·7	16·5	2·6
46	2 26·5	2 26·9	2 19·8	4·6	0·7	10·6	1·7	16·6	2·6
47	2 26·8	2 27·2	2 20·1	4·7	0·7	10·7	1·7	16·7	2·6
48	2 27·0	2 27·4	2 20·3	4·8	0·8	10·8	1·7	16·8	2·7
49	2 27·3	2 27·7	2 20·5	4·9	0·8	10·9	1·7	16·9	2·7
50	2 27·5	2 27·9	2 20·8	5·0	0·8	11·0	1·7	17·0	2·7
51	2 27·8	2 28·2	2 21·0	5·1	0·8	11·1	1·8	17·1	2·7
52	2 28·0	2 28·4	2 21·3	5·2	0·8	11·2	1·8	17·2	2·7
53	2 28·3	2 28·7	2 21·5	5·3	0·8	11·3	1·8	17·3	2·7
54	2 28·5	2 28·9	2 21·7	5·4	0·9	11·4	1·8	17·4	2·8
55	2 28·8	2 29·2	2 22·0	5·5	0·9	11·5	1·8	17·5	2·8
56	2 29·0	2 29·4	2 22·2	5·6	0·9	11·6	1·8	17·6	2·8
57	2 29·3	2 29·7	2 22·5	5·7	0·9	11·7	1·9	17·7	2·8
58	2 29·5	2 29·9	2 22·7	5·8	0·9	11·8	1·9	17·8	2·8
59	2 29·8	2 30·2	2 22·9	5·9	0·9	11·9	1·9	17·9	2·8
60	2 30·0	2 30·4	2 23·2	6·0	1·0	12·0	1·9	18·0	2·9

^{m} 10	SUN PLANETS	ARIES	MOON	v or d	Corrⁿ	v or d	Corrⁿ	v or d	Corrⁿ
s	° ′	° ′	° ′	′	′	′	′	′	′
00	2 30·0	2 30·4	2 23·2	0·0	0·0	6·0	1·1	12·0	2·1
01	2 30·3	2 30·7	2 23·4	0·1	0·0	6·1	1·1	12·1	2·1
02	2 30·5	2 30·9	2 23·6	0·2	0·0	6·2	1·1	12·2	2·1
03	2 30·8	2 31·2	2 23·9	0·3	0·1	6·3	1·1	12·3	2·2
04	2 31·0	2 31·4	2 24·1	0·4	0·1	6·4	1·1	12·4	2·2
05	2 31·3	2 31·7	2 24·4	0·5	0·1	6·5	1·1	12·5	2·2
06	2 31·5	2 31·9	2 24·6	0·6	0·1	6·6	1·2	12·6	2·2
07	2 31·8	2 32·2	2 24·8	0·7	0·1	6·7	1·2	12·7	2·2
08	2 32·0	2 32·4	2 25·1	0·8	0·1	6·8	1·2	12·8	2·2
09	2 32·3	2 32·7	2 25·3	0·9	0·2	6·9	1·2	12·9	2·3
10	2 32·5	2 32·9	2 25·6	1·0	0·2	7·0	1·2	13·0	2·3
11	2 32·8	2 33·2	2 25·8	1·1	0·2	7·1	1·2	13·1	2·3
12	2 33·0	2 33·4	2 26·0	1·2	0·2	7·2	1·3	13·2	2·3
13	2 33·3	2 33·7	2 26·3	1·3	0·2	7·3	1·3	13·3	2·3
14	2 33·5	2 33·9	2 26·5	1·4	0·2	7·4	1·3	13·4	2·3
15	2 33·8	2 34·2	2 26·7	1·5	0·3	7·5	1·3	13·5	2·4
16	2 34·0	2 34·4	2 27·0	1·6	0·3	7·6	1·3	13·6	2·4
17	2 34·3	2 34·7	2 27·2	1·7	0·3	7·7	1·3	13·7	2·4
18	2 34·5	2 34·9	2 27·5	1·8	0·3	7·8	1·4	13·8	2·4
19	2 34·8	2 35·2	2 27·7	1·9	0·3	7·9	1·4	13·9	2·4
20	2 35·0	2 35·4	2 27·9	2·0	0·4	8·0	1·4	14·0	2·5
21	2 35·3	2 35·7	2 28·2	2·1	0·4	8·1	1·4	14·1	2·5
22	2 35·5	2 35·9	2 28·4	2·2	0·4	8·2	1·4	14·2	2·5
23	2 35·8	2 36·2	2 28·7	2·3	0·4	8·3	1·5	14·3	2·5
24	2 36·0	2 36·4	2 28·9	2·4	0·4	8·4	1·5	14·4	2·5
25	2 36·3	2 36·7	2 29·1	2·5	0·4	8·5	1·5	14·5	2·5
26	2 36·5	2 36·9	2 29·4	2·6	0·5	8·6	1·5	14·6	2·6
27	2 36·8	2 37·2	2 29·6	2·7	0·5	8·7	1·5	14·7	2·6
28	2 37·0	2 37·4	2 29·8	2·8	0·5	8·8	1·5	14·8	2·6
29	2 37·3	2 37·7	2 30·1	2·9	0·5	8·9	1·6	14·9	2·6
30	2 37·5	2 37·9	2 30·3	3·0	0·5	9·0	1·6	15·0	2·6
31	2 37·8	2 38·2	2 30·6	3·1	0·5	9·1	1·6	15·1	2·6
32	2 38·0	2 38·4	2 30·8	3·2	0·6	9·2	1·6	15·2	2·7
33	2 38·3	2 38·7	2 31·0	3·3	0·6	9·3	1·6	15·3	2·7
34	2 38·5	2 38·9	2 31·3	3·4	0·6	9·4	1·6	15·4	2·7
35	2 38·8	2 39·2	2 31·5	3·5	0·6	9·5	1·7	15·5	2·7
36	2 39·0	2 39·4	2 31·8	3·6	0·6	9·6	1·7	15·6	2·7
37	2 39·3	2 39·7	2 32·0	3·7	0·6	9·7	1·7	15·7	2·7
38	2 39·5	2 39·9	2 32·2	3·8	0·7	9·8	1·7	15·8	2·8
39	2 39·8	2 40·2	2 32·5	3·9	0·7	9·9	1·7	15·9	2·8
40	2 40·0	2 40·4	2 32·7	4·0	0·7	10·0	1·8	16·0	2·8
41	2 40·3	2 40·7	2 32·9	4·1	0·7	10·1	1·8	16·1	2·8
42	2 40·5	2 40·9	2 33·2	4·2	0·7	10·2	1·8	16·2	2·8
43	2 40·8	2 41·2	2 33·4	4·3	0·8	10·3	1·8	16·3	2·9
44	2 41·0	2 41·4	2 33·7	4·4	0·8	10·4	1·8	16·4	2·9
45	2 41·3	2 41·7	2 33·9	4·5	0·8	10·5	1·8	16·5	2·9
46	2 41·5	2 41·9	2 34·1	4·6	0·8	10·6	1·9	16·6	2·9
47	2 41·8	2 42·2	2 34·4	4·7	0·8	10·7	1·9	16·7	2·9
48	2 42·0	2 42·4	2 34·6	4·8	0·8	10·8	1·9	16·8	2·9
49	2 42·3	2 42·7	2 34·9	4·9	0·9	10·9	1·9	16·9	3·0
50	2 42·5	2 42·9	2 35·1	5·0	0·9	11·0	1·9	17·0	3·0
51	2 42·8	2 43·2	2 35·3	5·1	0·9	11·1	1·9	17·1	3·0
52	2 43·0	2 43·4	2 35·6	5·2	0·9	11·2	2·0	17·2	3·0
53	2 43·3	2 43·7	2 35·8	5·3	0·9	11·3	2·0	17·3	3·0
54	2 43·5	2 43·9	2 36·1	5·4	0·9	11·4	2·0	17·4	3·0
55	2 43·8	2 44·2	2 36·3	5·5	1·0	11·5	2·0	17·5	3·1
56	2 44·0	2 44·4	2 36·5	5·6	1·0	11·6	2·0	17·6	3·1
57	2 44·3	2 44·7	2 36·8	5·7	1·0	11·7	2·0	17·7	3·1
58	2 44·5	2 45·0	2 37·0	5·8	1·0	11·8	2·1	17·8	3·1
59	2 44·8	2 45·2	2 37·2	5·9	1·0	11·9	2·1	17·9	3·1
60	2 45·0	2 45·5	2 37·5	6·0	1·1	12·0	2·1	18·0	3·2

^{m} 11	SUN PLANETS	ARIES	MOON	v or d	Corrⁿ	v or d	Corrⁿ	v or d	Corrⁿ
s	° ′	° ′	° ′	′	′	′	′	′	′
00	2 45·0	2 45·5	2 37·5	0·0	0·0	6·0	1·2	12·0	2·3
01	2 45·3	2 45·7	2 37·7	0·1	0·0	6·1	1·2	12·1	2·3
02	2 45·5	2 46·0	2 38·0	0·2	0·0	6·2	1·2	12·2	2·3
03	2 45·8	2 46·2	2 38·2	0·3	0·1	6·3	1·2	12·3	2·4
04	2 46·0	2 46·5	2 38·4	0·4	0·1	6·4	1·2	12·4	2·4
05	2 46·3	2 46·7	2 38·7	0·5	0·1	6·5	1·2	12·5	2·4
06	2 46·5	2 47·0	2 38·9	0·6	0·1	6·6	1·3	12·6	2·4
07	2 46·8	2 47·2	2 39·2	0·7	0·1	6·7	1·3	12·7	2·4
08	2 47·0	2 47·5	2 39·4	0·8	0·2	6·8	1·3	12·8	2·5
09	2 47·3	2 47·7	2 39·6	0·9	0·2	6·9	1·3	12·9	2·5
10	2 47·5	2 48·0	2 39·9	1·0	0·2	7·0	1·3	13·0	2·5
11	2 47·8	2 48·2	2 40·1	1·1	0·2	7·1	1·4	13·1	2·5
12	2 48·0	2 48·5	2 40·3	1·2	0·2	7·2	1·4	13·2	2·5
13	2 48·3	2 48·7	2 40·6	1·3	0·2	7·3	1·4	13·3	2·5
14	2 48·5	2 49·0	2 40·8	1·4	0·3	7·4	1·4	13·4	2·6
15	2 48·8	2 49·2	2 41·1	1·5	0·3	7·5	1·4	13·5	2·6
16	2 49·0	2 49·5	2 41·3	1·6	0·3	7·6	1·5	13·6	2·6
17	2 49·3	2 49·7	2 41·5	1·7	0·3	7·7	1·5	13·7	2·6
18	2 49·5	2 50·0	2 41·8	1·8	0·3	7·8	1·5	13·8	2·6
19	2 49·8	2 50·2	2 42·0	1·9	0·4	7·9	1·5	13·9	2·7
20	2 50·0	2 50·5	2 42·3	2·0	0·4	8·0	1·5	14·0	2·7
21	2 50·3	2 50·7	2 42·5	2·1	0·4	8·1	1·6	14·1	2·7
22	2 50·5	2 51·0	2 42·7	2·2	0·4	8·2	1·6	14·2	2·7
23	2 50·8	2 51·2	2 43·0	2·3	0·4	8·3	1·6	14·3	2·7
24	2 51·0	2 51·5	2 43·2	2·4	0·5	8·4	1·6	14·4	2·8
25	2 51·3	2 51·7	2 43·4	2·5	0·5	8·5	1·6	14·5	2·8
26	2 51·5	2 52·0	2 43·7	2·6	0·5	8·6	1·6	14·6	2·8
27	2 51·8	2 52·2	2 43·9	2·7	0·5	8·7	1·7	14·7	2·8
28	2 52·0	2 52·5	2 44·2	2·8	0·5	8·8	1·7	14·8	2·8
29	2 52·3	2 52·7	2 44·4	2·9	0·6	8·9	1·7	14·9	2·9
30	2 52·5	2 53·0	2 44·6	3·0	0·6	9·0	1·7	15·0	2·9
31	2 52·8	2 53·2	2 44·9	3·1	0·6	9·1	1·7	15·1	2·9
32	2 53·0	2 53·5	2 45·1	3·2	0·6	9·2	1·8	15·2	2·9
33	2 53·3	2 53·7	2 45·4	3·3	0·6	9·3	1·8	15·3	2·9
34	2 53·5	2 54·0	2 45·6	3·4	0·7	9·4	1·8	15·4	3·0
35	2 53·8	2 54·2	2 45·8	3·5	0·7	9·5	1·8	15·5	3·0
36	2 54·0	2 54·5	2 46·1	3·6	0·7	9·6	1·8	15·6	3·0
37	2 54·3	2 54·7	2 46·3	3·7	0·7	9·7	1·9	15·7	3·0
38	2 54·5	2 55·0	2 46·6	3·8	0·7	9·8	1·9	15·8	3·0
39	2 54·8	2 55·2	2 46·8	3·9	0·7	9·9	1·9	15·9	3·0
40	2 55·0	2 55·5	2 47·0	4·0	0·8	10·0	1·9	16·0	3·1
41	2 55·3	2 55·7	2 47·3	4·1	0·8	10·1	1·9	16·1	3·1
42	2 55·5	2 56·0	2 47·5	4·2	0·8	10·2	2·0	16·2	3·1
43	2 55·8	2 56·2	2 47·7	4·3	0·8	10·3	2·0	16·3	3·1
44	2 56·0	2 56·5	2 48·0	4·4	0·8	10·4	2·0	16·4	3·1
45	2 56·3	2 56·7	2 48·2	4·5	0·9	10·5	2·0	16·5	3·2
46	2 56·5	2 57·0	2 48·5	4·6	0·9	10·6	2·0	16·6	3·2
47	2 56·8	2 57·2	2 48·7	4·7	0·9	10·7	2·1	16·7	3·2
48	2 57·0	2 57·5	2 48·9	4·8	0·9	10·8	2·1	16·8	3·2
49	2 57·3	2 57·7	2 49·2	4·9	0·9	10·9	2·1	16·9	3·2
50	2 57·5	2 58·0	2 49·4	5·0	1·0	11·0	2·1	17·0	3·3
51	2 57·8	2 58·2	2 49·7	5·1	1·0	11·1	2·1	17·1	3·3
52	2 58·0	2 58·5	2 49·9	5·2	1·0	11·2	2·1	17·2	3·3
53	2 58·3	2 58·7	2 50·1	5·3	1·0	11·3	2·2	17·3	3·3
54	2 58·5	2 59·0	2 50·4	5·4	1·0	11·4	2·2	17·4	3·3
55	2 58·8	2 59·2	2 50·6	5·5	1·1	11·5	2·2	17·5	3·4
56	2 59·0	2 59·5	2 50·8	5·6	1·1	11·6	2·2	17·6	3·4
57	2 59·3	2 59·7	2 51·1	5·7	1·1	11·7	2·2	17·7	3·4
58	2 59·5	3 00·0	2 51·3	5·8	1·1	11·8	2·3	17·8	3·4
59	2 59·8	3 00·2	2 51·6	5·9	1·1	11·9	2·3	17·9	3·4
60	3 00·0	3 00·5	2 51·8	6·0	1·2	12·0	2·3	18·0	3·5

INCREMENTS AND CORRECTIONS

12^{m}	SUN PLANETS	ARIES	MOON	v or d	Corr^{n}	v or d	Corr^{n}	v or d	Corr^{n}
s	° ′	° ′	° ′	′	′	′	′	′	′
00	3 00·0	3 00·5	2 51·8	0·0	0·0	6·0	1·3	12·0	2·5
01	3 00·3	3 00·7	2 52·0	0·1	0·0	6·1	1·3	12·1	2·5
02	3 00·5	3 01·0	2 52·3	0·2	0·0	6·2	1·3	12·2	2·5
03	3 00·8	3 01·2	2 52·5	0·3	0·1	6·3	1·3	12·3	2·6
04	3 01·0	3 01·5	2 52·8	0·4	0·1	6·4	1·3	12·4	2·6
05	3 01·3	3 01·7	2 53·0	0·5	0·1	6·5	1·4	12·5	2·6
06	3 01·5	3 02·0	2 53·2	0·6	0·1	6·6	1·4	12·6	2·6
07	3 01·8	3 02·2	2 53·5	0·7	0·1	6·7	1·4	12·7	2·6
08	3 02·0	3 02·5	2 53·7	0·8	0·2	6·8	1·4	12·8	2·7
09	3 02·3	3 02·7	2 53·9	0·9	0·2	6·9	1·4	12·9	2·7
10	3 02·5	3 03·0	2 54·2	1·0	0·2	7·0	1·5	13·0	2·7
11	3 02·8	3 03·3	2 54·4	1·1	0·2	7·1	1·5	13·1	2·7
12	3 03·0	3 03·5	2 54·7	1·2	0·3	7·2	1·5	13·2	2·8
13	3 03·3	3 03·8	2 54·9	1·3	0·3	7·3	1·5	13·3	2·8
14	3 03·5	3 04·0	2 55·1	1·4	0·3	7·4	1·5	13·4	2·8
15	3 03·8	3 04·3	2 55·4	1·5	0·3	7·5	1·6	13·5	2·8
16	3 04·0	3 04·5	2 55·6	1·6	0·3	7·6	1·6	13·6	2·8
17	3 04·3	3 04·8	2 55·9	1·7	0·4	7·7	1·6	13·7	2·9
18	3 04·5	3 05·0	2 56·1	1·8	0·4	7·8	1·6	13·8	2·9
19	3 04·8	3 05·3	2 56·3	1·9	0·4	7·9	1·6	13·9	2·9
20	3 05·0	3 05·5	2 56·6	2·0	0·4	8·0	1·7	14·0	2·9
21	3 05·3	3 05·8	2 56·8	2·1	0·4	8·1	1·7	14·1	2·9
22	3 05·5	3 06·0	2 57·0	2·2	0·5	8·2	1·7	14·2	3·0
23	3 05·8	3 06·3	2 57·3	2·3	0·5	8·3	1·7	14·3	3·0
24	3 06·0	3 06·5	2 57·5	2·4	0·5	8·4	1·8	14·4	3·0
25	3 06·3	3 06·8	2 57·8	2·5	0·5	8·5	1·8	14·5	3·0
26	3 06·5	3 07·0	2 58·0	2·6	0·5	8·6	1·8	14·6	3·0
27	3 06·8	3 07·3	2 58·2	2·7	0·6	8·7	1·8	14·7	3·1
28	3 07·0	3 07·5	2 58·5	2·8	0·6	8·8	1·8	14·8	3·1
29	3 07·3	3 07·8	2 58·7	2·9	0·6	8·9	1·9	14·9	3·1
30	3 07·5	3 08·0	2 59·0	3·0	0·6	9·0	1·9	15·0	3·1
31	3 07·8	3 08·3	2 59·2	3·1	0·6	9·1	1·9	15·1	3·1
32	3 08·0	3 08·5	2 59·4	3·2	0·7	9·2	1·9	15·2	3·2
33	3 08·3	3 08·8	2 59·7	3·3	0·7	9·3	1·9	15·3	3·2
34	3 08·5	3 09·0	2 59·9	3·4	0·7	9·4	2·0	15·4	3·2
35	3 08·8	3 09·3	3 00·2	3·5	0·7	9·5	2·0	15·5	3·2
36	3 09·0	3 09·5	3 00·4	3·6	0·8	9·6	2·0	15·6	3·3
37	3 09·3	3 09·8	3 00·6	3·7	0·8	9·7	2·0	15·7	3·3
38	3 09·5	3 10·0	3 00·9	3·8	0·8	9·8	2·0	15·8	3·3
39	3 09·8	3 10·3	3 01·1	3·9	0·8	9·9	2·1	15·9	3·3
40	3 10·0	3 10·5	3 01·3	4·0	0·8	10·0	2·1	16·0	3·3
41	3 10·3	3 10·8	3 01·6	4·1	0·9	10·1	2·1	16·1	3·4
42	3 10·5	3 11·0	3 01·8	4·2	0·9	10·2	2·1	16·2	3·4
43	3 10·8	3 11·3	3 02·1	4·3	0·9	10·3	2·1	16·3	3·4
44	3 11·0	3 11·5	3 02·3	4·4	0·9	10·4	2·2	16·4	3·4
45	3 11·3	3 11·8	3 02·5	4·5	0·9	10·5	2·2	16·5	3·4
46	3 11·5	3 12·0	3 02·8	4·6	1·0	10·6	2·2	16·6	3·5
47	3 11·8	3 12·3	3 03·0	4·7	1·0	10·7	2·2	16·7	3·5
48	3 12·0	3 12·5	3 03·3	4·8	1·0	10·8	2·3	16·8	3·5
49	3 12·3	3 12·8	3 03·5	4·9	1·0	10·9	2·3	16·9	3·5
50	3 12·5	3 13·0	3 03·7	5·0	1·0	11·0	2·3	17·0	3·5
51	3 12·8	3 13·3	3 04·0	5·1	1·1	11·1	2·3	17·1	3·6
52	3 13·0	3 13·5	3 04·2	5·2	1·1	11·2	2·3	17·2	3·6
53	3 13·3	3 13·8	3 04·4	5·3	1·1	11·3	2·4	17·3	3·6
54	3 13·5	3 14·0	3 04·7	5·4	1·1	11·4	2·4	17·4	3·6
55	3 13·8	3 14·3	3 04·9	5·5	1·1	11·5	2·4	17·5	3·6
56	3 14·0	3 14·5	3 05·2	5·6	1·2	11·6	2·4	17·6	3·7
57	3 14·3	3 14·8	3 05·4	5·7	1·2	11·7	2·4	17·7	3·7
58	3 14·5	3 15·0	3 05·6	5·8	1·2	11·8	2·5	17·8	3·7
59	3 14·8	3 15·3	3 05·9	5·9	1·2	11·9	2·5	17·9	3·7
60	3 15·0	3 15·5	3 06·1	6·0	1·3	12·0	2·5	18·0	3·8

13^{m}	SUN PLANETS	ARIES	MOON	v or d	Corr^{n}	v or d	Corr^{n}	v or d	Corr^{n}
s	° ′	° ′	° ′	′	′	′	′	′	′
00	3 15·0	3 15·5	3 06·1	0·0	0·0	6·0	1·4	12·0	2·7
01	3 15·3	3 15·8	3 06·4	0·1	0·0	6·1	1·4	12·1	2·7
02	3 15·5	3 16·0	3 06·6	0·2	0·0	6·2	1·4	12·2	2·7
03	3 15·8	3 16·3	3 06·8	0·3	0·1	6·3	1·4	12·3	2·8
04	3 16·0	3 16·5	3 07·1	0·4	0·1	6·4	1·4	12·4	2·8
05	3 16·3	3 16·8	3 07·3	0·5	0·1	6·5	1·5	12·5	2·8
06	3 16·5	3 17·0	3 07·5	0·6	0·1	6·6	1·5	12·6	2·8
07	3 16·8	3 17·3	3 07·8	0·7	0·2	6·7	1·5	12·7	2·9
08	3 17·0	3 17·5	3 08·0	0·8	0·2	6·8	1·5	12·8	2·9
09	3 17·3	3 17·8	3 08·3	0·9	0·2	6·9	1·6	12·9	2·9
10	3 17·5	3 18·0	3 08·5	1·0	0·2	7·0	1·6	13·0	2·9
11	3 17·8	3 18·3	3 08·7	1·1	0·2	7·1	1·6	13·1	2·9
12	3 18·0	3 18·5	3 09·0	1·2	0·3	7·2	1·6	13·2	3·0
13	3 18·3	3 18·8	3 09·2	1·3	0·3	7·3	1·6	13·3	3·0
14	3 18·5	3 19·0	3 09·5	1·4	0·3	7·4	1·7	13·4	3·0
15	3 18·8	3 19·3	3 09·7	1·5	0·3	7·5	1·7	13·5	3·0
16	3 19·0	3 19·5	3 09·9	1·6	0·4	7·6	1·7	13·6	3·1
17	3 19·3	3 19·8	3 10·2	1·7	0·4	7·7	1·7	13·7	3·1
18	3 19·5	3 20·0	3 10·4	1·8	0·4	7·8	1·8	13·8	3·1
19	3 19·8	3 20·3	3 10·7	1·9	0·4	7·9	1·8	13·9	3·1
20	3 20·0	3 20·5	3 10·9	2·0	0·5	8·0	1·8	14·0	3·2
21	3 20·3	3 20·8	3 11·1	2·1	0·5	8·1	1·8	14·1	3·2
22	3 20·5	3 21·0	3 11·4	2·2	0·5	8·2	1·8	14·2	3·2
23	3 20·8	3 21·3	3 11·6	2·3	0·5	8·3	1·9	14·3	3·2
24	3 21·0	3 21·6	3 11·8	2·4	0·5	8·4	1·9	14·4	3·2
25	3 21·3	3 21·8	3 12·1	2·5	0·6	8·5	1·9	14·5	3·3
26	3 21·5	3 22·1	3 12·3	2·6	0·6	8·6	1·9	14·6	3·3
27	3 21·8	3 22·3	3 12·6	2·7	0·6	8·7	2·0	14·7	3·3
28	3 22·0	3 22·6	3 12·8	2·8	0·6	8·8	2·0	14·8	3·3
29	3 22·3	3 22·8	3 13·0	2·9	0·7	8·9	2·0	14·9	3·4
30	3 22·5	3 23·1	3 13·3	3·0	0·7	9·0	2·0	15·0	3·4
31	3 22·8	3 23·3	3 13·5	3·1	0·7	9·1	2·0	15·1	3·4
32	3 23·0	3 23·6	3 13·8	3·2	0·7	9·2	2·1	15·2	3·4
33	3 23·3	3 23·8	3 14·0	3·3	0·7	9·3	2·1	15·3	3·4
34	3 23·5	3 24·1	3 14·2	3·4	0·8	9·4	2·1	15·4	3·5
35	3 23·8	3 24·3	3 14·5	3·5	0·8	9·5	2·1	15·5	3·5
36	3 24·0	3 24·6	3 14·7	3·6	0·8	9·6	2·2	15·6	3·5
37	3 24·3	3 24·8	3 14·9	3·7	0·8	9·7	2·2	15·7	3·5
38	3 24·5	3 25·1	3 15·2	3·8	0·9	9·8	2·2	15·8	3·6
39	3 24·8	3 25·3	3 15·4	3·9	0·9	9·9	2·2	15·9	3·6
40	3 25·0	3 25·6	3 15·7	4·0	0·9	10·0	2·3	16·0	3·6
41	3 25·3	3 25·8	3 15·9	4·1	0·9	10·1	2·3	16·1	3·6
42	3 25·5	3 26·1	3 16·1	4·2	0·9	10·2	2·3	16·2	3·6
43	3 25·8	3 26·3	3 16·4	4·3	1·0	10·3	2·3	16·3	3·7
44	3 26·0	3 26·6	3 16·6	4·4	1·0	10·4	2·3	16·4	3·7
45	3 26·3	3 26·8	3 16·9	4·5	1·0	10·5	2·4	16·5	3·7
46	3 26·5	3 27·1	3 17·1	4·6	1·0	10·6	2·4	16·6	3·7
47	3 26·8	3 27·3	3 17·3	4·7	1·1	10·7	2·4	16·7	3·8
48	3 27·0	3 27·6	3 17·6	4·8	1·1	10·8	2·4	16·8	3·8
49	3 27·3	3 27·8	3 17·8	4·9	1·1	10·9	2·5	16·9	3·8
50	3 27·5	3 28·1	3 18·0	5·0	1·1	11·0	2·5	17·0	3·8
51	3 27·8	3 28·3	3 18·3	5·1	1·1	11·1	2·5	17·1	3·8
52	3 28·0	3 28·6	3 18·5	5·2	1·2	11·2	2·5	17·2	3·9
53	3 28·3	3 28·8	3 18·8	5·3	1·2	11·3	2·5	17·3	3·9
54	3 28·5	3 29·1	3 19·0	5·4	1·2	11·4	2·6	17·4	3·9
55	3 28·8	3 29·3	3 19·2	5·5	1·2	11·5	2·6	17·5	3·9
56	3 29·0	3 29·6	3 19·5	5·6	1·3	11·6	2·6	17·6	4·0
57	3 29·3	3 29·8	3 19·7	5·7	1·3	11·7	2·6	17·7	4·0
58	3 29·5	3 30·1	3 20·0	5·8	1·3	11·8	2·7	17·8	4·0
59	3 29·8	3 30·3	3 20·2	5·9	1·3	11·9	2·7	17·9	4·0
60	3 30·0	3 30·6	3 20·4	6·0	1·4	12·0	2·7	18·0	4·1

^{m} 14	SUN PLANETS	ARIES	MOON	v or d	Corr^n	v or d	Corr^n	v or d	Corr^n
s	° ′	° ′	° ′	′	′	′	′	′	′
00	3 30·0	3 30·6	3 20·4	0·0	0·0	6·0	1·5	12·0	2·9
01	3 30·3	3 30·8	3 20·7	0·1	0·0	6·1	1·5	12·1	2·9
02	3 30·5	3 31·1	3 20·9	0·2	0·0	6·2	1·5	12·2	2·9
03	3 30·8	3 31·3	3 21·1	0·3	0·1	6·3	1·5	12·3	3·0
04	3 31·0	3 31·6	3 21·4	0·4	0·1	6·4	1·5	12·4	3·0
05	3 31·3	3 31·8	3 21·6	0·5	0·1	6·5	1·6	12·5	3·0
06	3 31·5	3 32·1	3 21·9	0·6	0·1	6·6	1·6	12·6	3·0
07	3 31·8	3 32·3	3 22·1	0·7	0·2	6·7	1·6	12·7	3·1
08	3 32·0	3 32·6	3 22·3	0·8	0·2	6·8	1·6	12·8	3·1
09	3 32·3	3 32·8	3 22·6	0·9	0·2	6·9	1·7	12·9	3·1
10	3 32·5	3 33·1	3 22·8	1·0	0·2	7·0	1·7	13·0	3·1
11	3 32·8	3 33·3	3 23·1	1·1	0·3	7·1	1·7	13·1	3·2
12	3 33·0	3 33·6	3 23·3	1·2	0·3	7·2	1·7	13·2	3·2
13	3 33·3	3 33·8	3 23·5	1·3	0·3	7·3	1·8	13·3	3·2
14	3 33·5	3 34·1	3 23·8	1·4	0·3	7·4	1·8	13·4	3·2
15	3 33·8	3 34·3	3 24·0	1·5	0·4	7·5	1·8	13·5	3·3
16	3 34·0	3 34·6	3 24·3	1·6	0·4	7·6	1·8	13·6	3·3
17	3 34·3	3 34·8	3 24·5	1·7	0·4	7·7	1·9	13·7	3·3
18	3 34·5	3 35·1	3 24·7	1·8	0·4	7·8	1·9	13·8	3·3
19	3 34·8	3 35·3	3 25·0	1·9	0·5	7·9	1·9	13·9	3·4
20	3 35·0	3 35·6	3 25·2	2·0	0·5	8·0	1·9	14·0	3·4
21	3 35·3	3 35·8	3 25·4	2·1	0·5	8·1	2·0	14·1	3·4
22	3 35·5	3 36·1	3 25·7	2·2	0·5	8·2	2·0	14·2	3·4
23	3 35·8	3 36·3	3 25·9	2·3	0·6	8·3	2·0	14·3	3·5
24	3 36·0	3 36·6	3 26·2	2·4	0·6	8·4	2·0	14·4	3·5
25	3 36·3	3 36·8	3 26·4	2·5	0·6	8·5	2·1	14·5	3·5
26	3 36·5	3 37·1	3 26·6	2·6	0·6	8·6	2·1	14·6	3·5
27	3 36·8	3 37·3	3 26·9	2·7	0·7	8·7	2·1	14·7	3·6
28	3 37·0	3 37·6	3 27·1	2·8	0·7	8·8	2·1	14·8	3·6
29	3 37·3	3 37·8	3 27·4	2·9	0·7	8·9	2·2	14·9	3·6
30	3 37·5	3 38·1	3 27·6	3·0	0·7	9·0	2·2	15·0	3·6
31	3 37·8	3 38·3	3 27·8	3·1	0·7	9·1	2·2	15·1	3·6
32	3 38·0	3 38·6	3 28·1	3·2	0·8	9·2	2·2	15·2	3·7
33	3 38·3	3 38·8	3 28·3	3·3	0·8	9·3	2·2	15·3	3·7
34	3 38·5	3 39·1	3 28·5	3·4	0·8	9·4	2·3	15·4	3·7
35	3 38·8	3 39·3	3 28·8	3·5	0·8	9·5	2·3	15·5	3·7
36	3 39·0	3 39·6	3 29·0	3·6	0·9	9·6	2·3	15·6	3·8
37	3 39·3	3 39·9	3 29·3	3·7	0·9	9·7	2·3	15·7	3·8
38	3 39·5	3 40·1	3 29·5	3·8	0·9	9·8	2·4	15·8	3·8
39	3 39·8	3 40·4	3 29·7	3·9	0·9	9·9	2·4	15·9	3·8
40	3 40·0	3 40·6	3 30·0	4·0	1·0	10·0	2·4	16·0	3·9
41	3 40·3	3 40·9	3 30·2	4·1	1·0	10·1	2·4	16·1	3·9
42	3 40·5	3 41·1	3 30·5	4·2	1·0	10·2	2·5	16·2	3·9
43	3 40·8	3 41·4	3 30·7	4·3	1·0	10·3	2·5	16·3	3·9
44	3 41·0	3 41·6	3 30·9	4·4	1·1	10·4	2·5	16·4	4·0
45	3 41·3	3 41·9	3 31·2	4·5	1·1	10·5	2·5	16·5	4·0
46	3 41·5	3 42·1	3 31·4	4·6	1·1	10·6	2·6	16·6	4·0
47	3 41·8	3 42·4	3 31·6	4·7	1·1	10·7	2·6	16·7	4·0
48	3 42·0	3 42·6	3 31·9	4·8	1·2	10·8	2·6	16·8	4·1
49	3 42·3	3 42·9	3 32·1	4·9	1·2	10·9	2·6	16·9	4·1
50	3 42·5	3 43·1	3 32·4	5·0	1·2	11·0	2·7	17·0	4·1
51	3 42·8	3 43·4	3 32·6	5·1	1·2	11·1	2·7	17·1	4·1
52	3 43·0	3 43·6	3 32·8	5·2	1·3	11·2	2·7	17·2	4·2
53	3 43·3	3 43·9	3 33·1	5·3	1·3	11·3	2·7	17·3	4·2
54	3 43·5	3 44·1	3 33·3	5·4	1·3	11·4	2·8	17·4	4·2
55	3 43·8	3 44·4	3 33·6	5·5	1·3	11·5	2·8	17·5	4·2
56	3 44·0	3 44·6	3 33·8	5·6	1·4	11·6	2·8	17·6	4·3
57	3 44·3	3 44·9	3 34·0	5·7	1·4	11·7	2·8	17·7	4·3
58	3 44·5	3 45·1	3 34·3	5·8	1·4	11·8	2·9	17·8	4·3
59	3 44·8	3 45·4	3 34·5	5·9	1·4	11·9	2·9	17·9	4·3
60	3 45·0	3 45·6	3 34·8	6·0	1·5	12·0	2·9	18·0	4·4

^{m} 15	SUN PLANETS	ARIES	MOON	v or d	Corr^n	v or d	Corr^n	v or d	Corr^n
s	° ′	° ′	° ′	′	′	′	′	′	′
00	3 45·0	3 45·6	3 34·8	0·0	0·0	6·0	1·6	12·0	3·1
01	3 45·3	3 45·9	3 35·0	0·1	0·0	6·1	1·6	12·1	3·1
02	3 45·5	3 46·1	3 35·2	0·2	0·1	6·2	1·6	12·2	3·2
03	3 45·8	3 46·4	3 35·5	0·3	0·1	6·3	1·6	12·3	3·2
04	3 46·0	3 46·6	3 35·7	0·4	0·1	6·4	1·7	12·4	3·2
05	3 46·3	3 46·9	3 35·9	0·5	0·1	6·5	1·7	12·5	3·2
06	3 46·5	3 47·1	3 36·2	0·6	0·2	6·6	1·7	12·6	3·3
07	3 46·8	3 47·4	3 36·4	0·7	0·2	6·7	1·7	12·7	3·3
08	3 47·0	3 47·6	3 36·7	0·8	0·2	6·8	1·8	12·8	3·3
09	3 47·3	3 47·9	3 36·9	0·9	0·2	6·9	1·8	12·9	3·3
10	3 47·5	3 48·1	3 37·1	1·0	0·3	7·0	1·8	13·0	3·4
11	3 47·8	3 48·4	3 37·4	1·1	0·3	7·1	1·8	13·1	3·4
12	3 48·0	3 48·6	3 37·6	1·2	0·3	7·2	1·9	13·2	3·4
13	3 48·3	3 48·9	3 37·9	1·3	0·3	7·3	1·9	13·3	3·4
14	3 48·5	3 49·1	3 38·1	1·4	0·4	7·4	1·9	13·4	3·5
15	3 48·8	3 49·4	3 38·3	1·5	0·4	7·5	1·9	13·5	3·5
16	3 49·0	3 49·6	3 38·6	1·6	0·4	7·6	2·0	13·6	3·5
17	3 49·3	3 49·9	3 38·8	1·7	0·4	7·7	2·0	13·7	3·5
18	3 49·5	3 50·1	3 39·0	1·8	0·5	7·8	2·0	13·8	3·6
19	3 49·8	3 50·4	3 39·3	1·9	0·5	7·9	2·0	13·9	3·6
20	3 50·0	3 50·6	3 39·5	2·0	0·5	8·0	2·1	14·0	3·6
21	3 50·3	3 50·9	3 39·8	2·1	0·5	8·1	2·1	14·1	3·6
22	3 50·5	3 51·1	3 40·0	2·2	0·6	8·2	2·1	14·2	3·7
23	3 50·8	3 51·4	3 40·2	2·3	0·6	8·3	2·1	14·3	3·7
24	3 51·0	3 51·6	3 40·5	2·4	0·6	8·4	2·2	14·4	3·7
25	3 51·3	3 51·9	3 40·7	2·5	0·6	8·5	2·2	14·5	3·7
26	3 51·5	3 52·1	3 41·0	2·6	0·7	8·6	2·2	14·6	3·8
27	3 51·8	3 52·4	3 41·2	2·7	0·7	8·7	2·2	14·7	3·8
28	3 52·0	3 52·6	3 41·4	2·8	0·7	8·8	2·3	14·8	3·8
29	3 52·3	3 52·9	3 41·7	2·9	0·7	8·9	2·3	14·9	3·8
30	3 52·5	3 53·1	3 41·9	3·0	0·8	9·0	2·3	15·0	3·9
31	3 52·8	3 53·4	3 42·1	3·1	0·8	9·1	2·4	15·1	3·9
32	3 53·0	3 53·6	3 42·4	3·2	0·8	9·2	2·4	15·2	3·9
33	3 53·3	3 53·9	3 42·6	3·3	0·9	9·3	2·4	15·3	4·0
34	3 53·5	3 54·1	3 42·9	3·4	0·9	9·4	2·4	15·4	4·0
35	3 53·8	3 54·4	3 43·1	3·5	0·9	9·5	2·5	15·5	4·0
36	3 54·0	3 54·6	3 43·3	3·6	0·9	9·6	2·5	15·6	4·0
37	3 54·3	3 54·9	3 43·6	3·7	1·0	9·7	2·5	15·7	4·1
38	3 54·5	3 55·1	3 43·8	3·8	1·0	9·8	2·5	15·8	4·1
39	3 54·8	3 55·4	3 44·1	3·9	1·0	9·9	2·6	15·9	4·1
40	3 55·0	3 55·6	3 44·3	4·0	1·0	10·0	2·6	16·0	4·1
41	3 55·3	3 55·9	3 44·5	4·1	1·1	10·1	2·6	16·1	4·2
42	3 55·5	3 56·1	3 44·8	4·2	1·1	10·2	2·6	16·2	4·2
43	3 55·8	3 56·4	3 45·0	4·3	1·1	10·3	2·7	16·3	4·2
44	3 56·0	3 56·6	3 45·2	4·4	1·1	10·4	2·7	16·4	4·2
45	3 56·3	3 56·9	3 45·5	4·5	1·2	10·5	2·7	16·5	4·3
46	3 56·5	3 57·1	3 45·7	4·6	1·2	10·6	2·7	16·6	4·3
47	3 56·8	3 57·4	3 46·0	4·7	1·2	10·7	2·8	16·7	4·3
48	3 57·0	3 57·6	3 46·2	4·8	1·2	10·8	2·8	16·8	4·3
49	3 57·3	3 57·9	3 46·4	4·9	1·3	10·9	2·8	16·9	4·4
50	3 57·5	3 58·2	3 46·7	5·0	1·3	11·0	2·8	17·0	4·4
51	3 57·8	3 58·4	3 46·9	5·1	1·3	11·1	2·9	17·1	4·4
52	3 58·0	3 58·7	3 47·2	5·2	1·3	11·2	2·9	17·2	4·4
53	3 58·3	3 58·9	3 47·4	5·3	1·4	11·3	2·9	17·3	4·5
54	3 58·5	3 59·2	3 47·6	5·4	1·4	11·4	2·9	17·4	4·5
55	3 58·8	3 59·4	3 47·9	5·5	1·4	11·5	3·0	17·5	4·5
56	3 59·0	3 59·7	3 48·1	5·6	1·4	11·6	3·0	17·6	4·5
57	3 59·3	3 59·9	3 48·4	5·7	1·5	11·7	3·0	17·7	4·6
58	3 59·5	4 00·2	3 48·6	5·8	1·5	11·8	3·0	17·8	4·6
59	3 59·8	4 00·4	3 48·8	5·9	1·5	11·9	3·1	17·9	4·6
60	4 00·0	4 00·7	3 49·1	6·0	1·6	12·0	3·1	18·0	4·7

16^m	SUN PLANETS	ARIES	MOON	v or d	Corr^n	v or d	Corr^n	v or d	Corr^n
s	° ′	° ′	° ′	′	′	′	′	′	′
00	4 00·0	4 00·7	3 49·1	0·0	0·0	6·0	1·7	12·0	3·3
01	4 00·3	4 00·9	3 49·3	0·1	0·0	6·1	1·7	12·1	3·3
02	4 00·5	4 01·2	3 49·5	0·2	0·1	6·2	1·7	12·2	3·4
03	4 00·8	4 01·4	3 49·8	0·3	0·1	6·3	1·7	12·3	3·4
04	4 01·0	4 01·7	3 50·0	0·4	0·1	6·4	1·8	12·4	3·4
05	4 01·3	4 01·9	3 50·3	0·5	0·1	6·5	1·8	12·5	3·4
06	4 01·5	4 02·2	3 50·5	0·6	0·2	6·6	1·8	12·6	3·5
07	4 01·8	4 02·4	3 50·7	0·7	0·2	6·7	1·8	12·7	3·5
08	4 02·0	4 02·7	3 51·0	0·8	0·2	6·8	1·9	12·8	3·5
09	4 02·3	4 02·9	3 51·2	0·9	0·2	6·9	1·9	12·9	3·5
10	4 02·5	4 03·2	3 51·5	1·0	0·3	7·0	1·9	13·0	3·6
11	4 02·8	4 03·4	3 51·7	1·1	0·3	7·1	2·0	13·1	3·6
12	4 03·0	4 03·7	3 51·9	1·2	0·3	7·2	2·0	13·2	3·6
13	4 03·3	4 03·9	3 52·2	1·3	0·4	7·3	2·0	13·3	3·7
14	4 03·5	4 04·2	3 52·4	1·4	0·4	7·4	2·0	13·4	3·7
15	4 03·8	4 04·4	3 52·6	1·5	0·4	7·5	2·1	13·5	3·7
16	4 04·0	4 04·7	3 52·9	1·6	0·4	7·6	2·1	13·6	3·7
17	4 04·3	4 04·9	3 53·1	1·7	0·5	7·7	2·1	13·7	3·8
18	4 04·5	4 05·2	3 53·4	1·8	0·5	7·8	2·1	13·8	3·8
19	4 04·8	4 05·4	3 53·6	1·9	0·5	7·9	2·2	13·9	3·8
20	4 05·0	4 05·7	3 53·8	2·0	0·6	8·0	2·2	14·0	3·9
21	4 05·3	4 05·9	3 54·1	2·1	0·6	8·1	2·2	14·1	3·9
22	4 05·5	4 06·2	3 54·3	2·2	0·6	8·2	2·3	14·2	3·9
23	4 05·8	4 06·4	3 54·6	2·3	0·6	8·3	2·3	14·3	3·9
24	4 06·0	4 06·7	3 54·8	2·4	0·7	8·4	2·3	14·4	4·0
25	4 06·3	4 06·9	3 55·0	2·5	0·7	8·5	2·3	14·5	4·0
26	4 06·5	4 07·2	3 55·3	2·6	0·7	8·6	2·4	14·6	4·0
27	4 06·8	4 07·4	3 55·5	2·7	0·7	8·7	2·4	14·7	4·0
28	4 07·0	4 07·7	3 55·7	2·8	0·8	8·8	2·4	14·8	4·1
29	4 07·3	4 07·9	3 56·0	2·9	0·8	8·9	2·4	14·9	4·1
30	4 07·5	4 08·2	3 56·2	3·0	0·8	9·0	2·5	15·0	4·1
31	4 07·8	4 08·4	3 56·5	3·1	0·9	9·1	2·5	15·1	4·2
32	4 08·0	4 08·7	3 56·7	3·2	0·9	9·2	2·5	15·2	4·2
33	4 08·3	4 08·9	3 56·9	3·3	0·9	9·3	2·6	15·3	4·2
34	4 08·5	4 09·2	3 57·2	3·4	0·9	9·4	2·6	15·4	4·2
35	4 08·8	4 09·4	3 57·4	3·5	1·0	9·5	2·6	15·5	4·3
36	4 09·0	4 09·7	3 57·7	3·6	1·0	9·6	2·6	15·6	4·3
37	4 09·3	4 09·9	3 57·9	3·7	1·0	9·7	2·7	15·7	4·3
38	4 09·5	4 10·2	3 58·1	3·8	1·0	9·8	2·7	15·8	4·3
39	4 09·8	4 10·4	3 58·4	3·9	1·1	9·9	2·7	15·9	4·4
40	4 10·0	4 10·7	3 58·6	4·0	1·1	10·0	2·8	16·0	4·4
41	4 10·3	4 10·9	3 58·8	4·1	1·1	10·1	2·8	16·1	4·4
42	4 10·5	4 11·2	3 59·1	4·2	1·2	10·2	2·8	16·2	4·5
43	4 10·8	4 11·4	3 59·3	4·3	1·2	10·3	2·8	16·3	4·5
44	4 11·0	4 11·7	3 59·6	4·4	1·2	10·4	2·9	16·4	4·5
45	4 11·3	4 11·9	3 59·8	4·5	1·2	10·5	2·9	16·5	4·5
46	4 11·5	4 12·2	4 00·0	4·6	1·3	10·6	2·9	16·6	4·6
47	4 11·8	4 12·4	4 00·3	4·7	1·3	10·7	2·9	16·7	4·6
48	4 12·0	4 12·7	4 00·5	4·8	1·3	10·8	3·0	16·8	4·6
49	4 12·3	4 12·9	4 00·8	4·9	1·3	10·9	3·0	16·9	4·6
50	4 12·5	4 13·2	4 01·0	5·0	1·4	11·0	3·0	17·0	4·7
51	4 12·8	4 13·4	4 01·2	5·1	1·4	11·1	3·1	17·1	4·7
52	4 13·0	4 13·7	4 01·5	5·2	1·4	11·2	3·1	17·2	4·7
53	4 13·3	4 13·9	4 01·7	5·3	1·5	11·3	3·1	17·3	4·8
54	4 13·5	4 14·2	4 02·0	5·4	1·5	11·4	3·1	17·4	4·8
55	4 13·8	4 14·4	4 02·2	5·5	1·5	11·5	3·2	17·5	4·8
56	4 14·0	4 14·7	4 02·4	5·6	1·5	11·6	3·2	17·6	4·8
57	4 14·3	4 14·9	4 02·7	5·7	1·6	11·7	3·2	17·7	4·9
58	4 14·5	4 15·2	4 02·9	5·8	1·6	11·8	3·2	17·8	4·9
59	4 14·8	4 15·4	4 03·1	5·9	1·6	11·9	3·3	17·9	4·9
60	4 15·0	4 15·7	4 03·4	6·0	1·7	12·0	3·3	18·0	5·0

17^m	SUN PLANETS	ARIES	MOON	v or d	Corr^n	v or d	Corr^n	v or d	Corr^n
s	° ′	° ′	° ′	′	′	′	′	′	′
00	4 15·0	4 15·7	4 03·4	0·0	0·0	6·0	1·8	12·0	3·5
01	4 15·3	4 15·9	4 03·6	0·1	0·0	6·1	1·8	12·1	3·5
02	4 15·5	4 16·2	4 03·9	0·2	0·1	6·2	1·8	12·2	3·6
03	4 15·8	4 16·5	4 04·1	0·3	0·1	6·3	1·8	12·3	3·6
04	4 16·0	4 16·7	4 04·3	0·4	0·1	6·4	1·9	12·4	3·6
05	4 16·3	4 17·0	4 04·6	0·5	0·1	6·5	1·9	12·5	3·6
06	4 16·5	4 17·2	4 04·8	0·6	0·2	6·6	1·9	12·6	3·7
07	4 16·8	4 17·5	4 05·1	0·7	0·2	6·7	2·0	12·7	3·7
08	4 17·0	4 17·7	4 05·3	0·8	0·2	6·8	2·0	12·8	3·7
09	4 17·3	4 18·0	4 05·5	0·9	0·3	6·9	2·0	12·9	3·8
10	4 17·5	4 18·2	4 05·8	1·0	0·3	7·0	2·0	13·0	3·8
11	4 17·8	4 18·5	4 06·0	1·1	0·3	7·1	2·1	13·1	3·8
12	4 18·0	4 18·7	4 06·2	1·2	0·4	7·2	2·1	13·2	3·9
13	4 18·3	4 19·0	4 06·5	1·3	0·4	7·3	2·1	13·3	3·9
14	4 18·5	4 19·2	4 06·7	1·4	0·4	7·4	2·2	13·4	3·9
15	4 18·8	4 19·5	4 07·0	1·5	0·4	7·5	2·2	13·5	3·9
16	4 19·0	4 19·7	4 07·2	1·6	0·5	7·6	2·2	13·6	4·0
17	4 19·3	4 20·0	4 07·4	1·7	0·5	7·7	2·2	13·7	4·0
18	4 19·5	4 20·2	4 07·7	1·8	0·5	7·8	2·3	13·8	4·0
19	4 19·8	4 20·5	4 07·9	1·9	0·6	7·9	2·3	13·9	4·1
20	4 20·0	4 20·7	4 08·2	2·0	0·6	8·0	2·3	14·0	4·1
21	4 20·3	4 21·0	4 08·4	2·1	0·6	8·1	2·4	14·1	4·1
22	4 20·5	4 21·2	4 08·6	2·2	0·6	8·2	2·4	14·2	4·1
23	4 20·8	4 21·5	4 08·9	2·3	0·7	8·3	2·4	14·3	4·2
24	4 21·0	4 21·7	4 09·1	2·4	0·7	8·4	2·5	14·4	4·2
25	4 21·3	4 22·0	4 09·3	2·5	0·7	8·5	2·5	14·5	4·2
26	4 21·5	4 22·2	4 09·6	2·6	0·8	8·6	2·5	14·6	4·3
27	4 21·8	4 22·5	4 09·8	2·7	0·8	8·7	2·5	14·7	4·3
28	4 22·0	4 22·7	4 10·1	2·8	0·8	8·8	2·6	14·8	4·3
29	4 22·3	4 23·0	4 10·3	2·9	0·8	8·9	2·6	14·9	4·3
30	4 22·5	4 23·2	4 10·5	3·0	0·9	9·0	2·6	15·0	4·4
31	4 22·8	4 23·5	4 10·8	3·1	0·9	9·1	2·7	15·1	4·4
32	4 23·0	4 23·7	4 11·0	3·2	0·9	9·2	2·7	15·2	4·4
33	4 23·3	4 24·0	4 11·3	3·3	1·0	9·3	2·7	15·3	4·5
34	4 23·5	4 24·2	4 11·5	3·4	1·0	9·4	2·7	15·4	4·5
35	4 23·8	4 24·5	4 11·7	3·5	1·0	9·5	2·8	15·5	4·5
36	4 24·0	4 24·7	4 12·0	3·6	1·1	9·6	2·8	15·6	4·6
37	4 24·3	4 25·0	4 12·2	3·7	1·1	9·7	2·8	15·7	4·6
38	4 24·5	4 25·2	4 12·5	3·8	1·1	9·8	2·9	15·8	4·6
39	4 24·8	4 25·5	4 12·7	3·9	1·1	9·9	2·9	15·9	4·6
40	4 25·0	4 25·7	4 12·9	4·0	1·2	10·0	2·9	16·0	4·7
41	4 25·3	4 26·0	4 13·2	4·1	1·2	10·1	2·9	16·1	4·7
42	4 25·5	4 26·2	4 13·4	4·2	1·2	10·2	3·0	16·2	4·7
43	4 25·8	4 26·5	4 13·6	4·3	1·3	10·3	3·0	16·3	4·8
44	4 26·0	4 26·7	4 13·9	4·4	1·3	10·4	3·0	16·4	4·8
45	4 26·3	4 27·0	4 14·1	4·5	1·3	10·5	3·1	16·5	4·8
46	4 26·5	4 27·2	4 14·4	4·6	1·3	10·6	3·1	16·6	4·8
47	4 26·8	4 27·5	4 14·6	4·7	1·4	10·7	3·1	16·7	4·9
48	4 27·0	4 27·7	4 14·8	4·8	1·4	10·8	3·2	16·8	4·9
49	4 27·3	4 28·0	4 15·1	4·9	1·4	10·9	3·2	16·9	4·9
50	4 27·5	4 28·2	4 15·3	5·0	1·5	11·0	3·2	17·0	5·0
51	4 27·8	4 28·5	4 15·6	5·1	1·5	11·1	3·2	17·1	5·0
52	4 28·0	4 28·7	4 15·8	5·2	1·5	11·2	3·3	17·2	5·0
53	4 28·3	4 29·0	4 16·0	5·3	1·5	11·3	3·3	17·3	5·0
54	4 28·5	4 29·2	4 16·3	5·4	1·6	11·4	3·3	17·4	5·1
55	4 28·8	4 29·5	4 16·5	5·5	1·6	11·5	3·4	17·5	5·1
56	4 29·0	4 29·7	4 16·7	5·6	1·6	11·6	3·4	17·6	5·1
57	4 29·3	4 30·0	4 17·0	5·7	1·7	11·7	3·4	17·7	5·2
58	4 29·5	4 30·2	4 17·2	5·8	1·7	11·8	3·4	17·8	5·2
59	4 29·8	4 30·5	4 17·5	5·9	1·7	11·9	3·5	17·9	5·2
60	4 30·0	4 30·7	4 17·7	6·0	1·8	12·0	3·5	18·0	5·3

^{m} 18	SUN PLANETS	ARIES	MOON	v or d	Corrⁿ	v or d	Corrⁿ	v or d	Corrⁿ
s	° ′	° ′	° ′	′	′	′	′	′	′
00	4 30·0	4 30·7	4 17·7	0·0	0·0	6·0	1·9	12·0	3·7
01	4 30·3	4 31·0	4 17·9	0·1	0·0	6·1	1·9	12·1	3·7
02	4 30·5	4 31·2	4 18·2	0·2	0·1	6·2	1·9	12·2	3·8
03	4 30·8	4 31·5	4 18·4	0·3	0·1	6·3	1·9	12·3	3·8
04	4 31·0	4 31·7	4 18·7	0·4	0·1	6·4	2·0	12·4	3·8
05	4 31·3	4 32·0	4 18·9	0·5	0·2	6·5	2·0	12·5	3·9
06	4 31·5	4 32·2	4 19·1	0·6	0·2	6·6	2·0	12·6	3·9
07	4 31·8	4 32·5	4 19·4	0·7	0·2	6·7	2·1	12·7	3·9
08	4 32·0	4 32·7	4 19·6	0·8	0·2	6·8	2·1	12·8	3·9
09	4 32·3	4 33·0	4 19·8	0·9	0·3	6·9	2·1	12·9	4·0
10	4 32·5	4 33·2	4 20·1	1·0	0·3	7·0	2·2	13·0	4·0
11	4 32·8	4 33·5	4 20·3	1·1	0·3	7·1	2·2	13·1	4·0
12	4 33·0	4 33·7	4 20·6	1·2	0·4	7·2	2·2	13·2	4·1
13	4 33·3	4 34·0	4 20·8	1·3	0·4	7·3	2·3	13·3	4·1
14	4 33·5	4 34·2	4 21·0	1·4	0·4	7·4	2·3	13·4	4·1
15	4 33·8	4 34·5	4 21·3	1·5	0·5	7·5	2·3	13·5	4·2
16	4 34·0	4 34·8	4 21·5	1·6	0·5	7·6	2·3	13·6	4·2
17	4 34·3	4 35·0	4 21·8	1·7	0·5	7·7	2·4	13·7	4·2
18	4 34·5	4 35·3	4 22·0	1·8	0·6	7·8	2·4	13·8	4·3
19	4 34·8	4 35·5	4 22·2	1·9	0·6	7·9	2·4	13·9	4·3
20	4 35·0	4 35·8	4 22·5	2·0	0·6	8·0	2·5	14·0	4·3
21	4 35·3	4 36·0	4 22·7	2·1	0·6	8·1	2·5	14·1	4·3
22	4 35·5	4 36·3	4 22·9	2·2	0·7	8·2	2·5	14·2	4·4
23	4 35·8	4 36·5	4 23·2	2·3	0·7	8·3	2·6	14·3	4·4
24	4 36·0	4 36·8	4 23·4	2·4	0·7	8·4	2·6	14·4	4·4
25	4 36·3	4 37·0	4 23·7	2·5	0·8	8·5	2·6	14·5	4·5
26	4 36·5	4 37·3	4 23·9	2·6	0·8	8·6	2·7	14·6	4·5
27	4 36·8	4 37·5	4 24·1	2·7	0·8	8·7	2·7	14·7	4·5
28	4 37·0	4 37·8	4 24·4	2·8	0·9	8·8	2·7	14·8	4·6
29	4 37·3	4 38·0	4 24·6	2·9	0·9	8·9	2·7	14·9	4·6
30	4 37·5	4 38·3	4 24·9	3·0	0·9	9·0	2·8	15·0	4·6
31	4 37·8	4 38·5	4 25·1	3·1	1·0	9·1	2·8	15·1	4·7
32	4 38·0	4 38·8	4 25·3	3·2	1·0	9·2	2·8	15·2	4·7
33	4 38·3	4 39·0	4 25·6	3·3	1·0	9·3	2·9	15·3	4·7
34	4 38·5	4 39·3	4 25·8	3·4	1·0	9·4	2·9	15·4	4·7
35	4 38·8	4 39·5	4 26·1	3·5	1·1	9·5	2·9	15·5	4·8
36	4 39·0	4 39·8	4 26·3	3·6	1·1	9·6	3·0	15·6	4·8
37	4 39·3	4 40·0	4 26·5	3·7	1·1	9·7	3·0	15·7	4·8
38	4 39·5	4 40·3	4 26·8	3·8	1·2	9·8	3·0	15·8	4·9
39	4 39·8	4 40·5	4 27·0	3·9	1·2	9·9	3·1	15·9	4·9
40	4 40·0	4 40·8	4 27·2	4·0	1·2	10·0	3·1	16·0	4·9
41	4 40·3	4 41·0	4 27·5	4·1	1·3	10·1	3·1	16·1	5·0
42	4 40·5	4 41·3	4 27·7	4·2	1·3	10·2	3·1	16·2	5·0
43	4 40·8	4 41·5	4 28·0	4·3	1·3	10·3	3·2	16·3	5·0
44	4 41·0	4 41·8	4 28·2	4·4	1·4	10·4	3·2	16·4	5·1
45	4 41·3	4 42·0	4 28·4	4·5	1·4	10·5	3·2	16·5	5·1
46	4 41·5	4 42·3	4 28·7	4·6	1·4	10·6	3·3	16·6	5·1
47	4 41·8	4 42·5	4 28·9	4·7	1·4	10·7	3·3	16·7	5·1
48	4 42·0	4 42·8	4 29·2	4·8	1·5	10·8	3·3	16·8	5·2
49	4 42·3	4 43·0	4 29·4	4·9	1·5	10·9	3·4	16·9	5·2
50	4 42·5	4 43·3	4 29·6	5·0	1·5	11·0	3·4	17·0	5·2
51	4 42·8	4 43·5	4 29·9	5·1	1·6	11·1	3·4	17·1	5·3
52	4 43·0	4 43·8	4 30·1	5·2	1·6	11·2	3·5	17·2	5·3
53	4 43·3	4 44·0	4 30·3	5·3	1·6	11·3	3·5	17·3	5·3
54	4 43·5	4 44·3	4 30·6	5·4	1·7	11·4	3·5	17·4	5·4
55	4 43·8	4 44·5	4 30·8	5·5	1·7	11·5	3·5	17·5	5·4
56	4 44·0	4 44·8	4 31·1	5·6	1·7	11·6	3·6	17·6	5·4
57	4 44·3	4 45·0	4 31·3	5·7	1·8	11·7	3·6	17·7	5·5
58	4 44·5	4 45·3	4 31·5	5·8	1·8	11·8	3·6	17·8	5·5
59	4 44·8	4 45·5	4 31·8	5·9	1·8	11·9	3·7	17·9	5·5
60	4 45·0	4 45·8	4 32·0	6·0	1·9	12·0	3·7	18·0	5·6

^{m} 19	SUN PLANETS	ARIES	MOON	v or d	Corrⁿ	v or d	Corrⁿ	v or d	Corrⁿ
s	° ′	° ′	° ′	′	′	′	′	′	′
00	4 45·0	4 45·8	4 32·0	0·0	0·0	6·0	2·0	12·0	3·9
01	4 45·3	4 46·0	4 32·3	0·1	0·0	6·1	2·0	12·1	3·9
02	4 45·5	4 46·3	4 32·5	0·2	0·1	6·2	2·0	12·2	4·0
03	4 45·8	4 46·5	4 32·7	0·3	0·1	6·3	2·0	12·3	4·0
04	4 46·0	4 46·8	4 33·0	0·4	0·1	6·4	2·1	12·4	4·0
05	4 46·3	4 47·0	4 33·2	0·5	0·2	6·5	2·1	12·5	4·1
06	4 46·5	4 47·3	4 33·4	0·6	0·2	6·6	2·1	12·6	4·1
07	4 46·8	4 47·5	4 33·7	0·7	0·2	6·7	2·2	12·7	4·1
08	4 47·0	4 47·8	4 33·9	0·8	0·3	6·8	2·2	12·8	4·2
09	4 47·3	4 48·0	4 34·2	0·9	0·3	6·9	2·2	12·9	4·2
10	4 47·5	4 48·3	4 34·4	1·0	0·3	7·0	2·3	13·0	4·2
11	4 47·8	4 48·5	4 34·6	1·1	0·4	7·1	2·3	13·1	4·3
12	4 48·0	4 48·8	4 34·9	1·2	0·4	7·2	2·3	13·2	4·3
13	4 48·3	4 49·0	4 35·1	1·3	0·4	7·3	2·4	13·3	4·3
14	4 48·5	4 49·3	4 35·4	1·4	0·5	7·4	2·4	13·4	4·4
15	4 48·8	4 49·5	4 35·6	1·5	0·5	7·5	2·4	13·5	4·4
16	4 49·0	4 49·8	4 35·8	1·6	0·5	7·6	2·5	13·6	4·4
17	4 49·3	4 50·0	4 36·1	1·7	0·6	7·7	2·5	13·7	4·5
18	4 49·5	4 50·3	4 36·3	1·8	0·6	7·8	2·5	13·8	4·5
19	4 49·8	4 50·5	4 36·6	1·9	0·6	7·9	2·6	13·9	4·5
20	4 50·0	4 50·8	4 36·8	2·0	0·7	8·0	2·6	14·0	4·6
21	4 50·3	4 51·0	4 37·0	2·1	0·7	8·1	2·6	14·1	4·6
22	4 50·5	4 51·3	4 37·3	2·2	0·7	8·2	2·7	14·2	4·6
23	4 50·8	4 51·5	4 37·5	2·3	0·7	8·3	2·7	14·3	4·6
24	4 51·0	4 51·8	4 37·7	2·4	0·8	8·4	2·7	14·4	4·7
25	4 51·3	4 52·0	4 38·0	2·5	0·8	8·5	2·8	14·5	4·7
26	4 51·5	4 52·3	4 38·2	2·6	0·8	8·6	2·8	14·6	4·7
27	4 51·8	4 52·5	4 38·5	2·7	0·9	8·7	2·8	14·7	4·8
28	4 52·0	4 52·8	4 38·7	2·8	0·9	8·8	2·9	14·8	4·8
29	4 52·3	4 53·1	4 38·9	2·9	0·9	8·9	2·9	14·9	4·8
30	4 52·5	4 53·3	4 39·2	3·0	1·0	9·0	2·9	15·0	4·9
31	4 52·8	4 53·6	4 39·4	3·1	1·0	9·1	3·0	15·1	4·9
32	4 53·0	4 53·8	4 39·7	3·2	1·0	9·2	3·0	15·2	4·9
33	4 53·3	4 54·1	4 39·9	3·3	1·1	9·3	3·0	15·3	5·0
34	4 53·5	4 54·3	4 40·1	3·4	1·1	9·4	3·1	15·4	5·0
35	4 53·8	4 54·6	4 40·4	3·5	1·1	9·5	3·1	15·5	5·0
36	4 54·0	4 54·8	4 40·6	3·6	1·2	9·6	3·1	15·6	5·1
37	4 54·3	4 55·1	4 40·8	3·7	1·2	9·7	3·2	15·7	5·1
38	4 54·5	4 55·3	4 41·1	3·8	1·2	9·8	3·2	15·8	5·1
39	4 54·8	4 55·6	4 41·3	3·9	1·3	9·9	3·2	15·9	5·2
40	4 55·0	4 55·8	4 41·6	4·0	1·3	10·0	3·3	16·0	5·2
41	4 55·3	4 56·1	4 41·8	4·1	1·3	10·1	3·3	16·1	5·2
42	4 55·5	4 56·3	4 42·0	4·2	1·4	10·2	3·3	16·2	5·3
43	4 55·8	4 56·6	4 42·3	4·3	1·4	10·3	3·3	16·3	5·3
44	4 56·0	4 56·8	4 42·5	4·4	1·4	10·4	3·4	16·4	5·3
45	4 56·3	4 57·1	4 42·8	4·5	1·5	10·5	3·4	16·5	5·4
46	4 56·5	4 57·3	4 43·0	4·6	1·5	10·6	3·4	16·6	5·4
47	4 56·8	4 57·6	4 43·2	4·7	1·5	10·7	3·5	16·7	5·4
48	4 57·0	4 57·8	4 43·5	4·8	1·6	10·8	3·5	16·8	5·5
49	4 57·3	4 58·1	4 43·7	4·9	1·6	10·9	3·5	16·9	5·5
50	4 57·5	4 58·3	4 43·9	5·0	1·6	11·0	3·6	17·0	5·5
51	4 57·8	4 58·6	4 44·2	5·1	1·7	11·1	3·6	17·1	5·6
52	4 58·0	4 58·8	4 44·4	5·2	1·7	11·2	3·6	17·2	5·6
53	4 58·3	4 59·1	4 44·7	5·3	1·7	11·3	3·7	17·3	5·6
54	4 58·5	4 59·3	4 44·9	5·4	1·8	11·4	3·7	17·4	5·7
55	4 58·8	4 59·6	4 45·1	5·5	1·8	11·5	3·7	17·5	5·7
56	4 59·0	4 59·8	4 45·4	5·6	1·8	11·6	3·8	17·6	5·7
57	4 59·3	5 00·1	4 45·6	5·7	1·9	11·7	3·8	17·7	5·8
58	4 59·5	5 00·3	4 45·9	5·8	1·9	11·8	3·8	17·8	5·8
59	4 59·8	5 00·6	4 46·1	5·9	1·9	11·9	3·9	17·9	5·8
60	5 00·0	5 00·8	4 46·3	6·0	2·0	12·0	3·9	18·0	5·9

20^{m}	SUN PLANETS	ARIES	MOON	*v* or *d*	Corr^{n}	*v* or *d*	Corr^{n}	*v* or *d*	Corr^{n}
s	° ′	° ′	° ′	′	′	′	′	′	′
00	5 00·0	5 00·8	4 46·3	0·0	0·0	6·0	2·1	12·0	4·1
01	5 00·3	5 01·1	4 46·6	0·1	0·0	6·1	2·1	12·1	4·1
02	5 00·5	5 01·3	4 46·8	0·2	0·1	6·2	2·1	12·2	4·2
03	5 00·8	5 01·6	4 47·0	0·3	0·1	6·3	2·2	12·3	4·2
04	5 01·0	5 01·8	4 47·3	0·4	0·1	6·4	2·2	12·4	4·2
05	5 01·3	5 02·1	4 47·5	0·5	0·2	6·5	2·2	12·5	4·3
06	5 01·5	5 02·3	4 47·8	0·6	0·2	6·6	2·3	12·6	4·3
07	5 01·8	5 02·6	4 48·0	0·7	0·2	6·7	2·3	12·7	4·3
08	5 02·0	5 02·8	4 48·2	0·8	0·3	6·8	2·3	12·8	4·4
09	5 02·3	5 03·1	4 48·5	0·9	0·3	6·9	2·4	12·9	4·4
10	5 02·5	5 03·3	4 48·7	1·0	0·3	7·0	2·4	13·0	4·4
11	5 02·8	5 03·6	4 49·0	1·1	0·4	7·1	2·4	13·1	4·5
12	5 03·0	5 03·8	4 49·2	1·2	0·4	7·2	2·5	13·2	4·5
13	5 03·3	5 04·1	4 49·4	1·3	0·4	7·3	2·5	13·3	4·5
14	5 03·5	5 04·3	4 49·7	1·4	0·5	7·4	2·5	13·4	4·6
15	5 03·8	5 04·6	4 49·9	1·5	0·5	7·5	2·6	13·5	4·6
16	5 04·0	5 04·8	4 50·2	1·6	0·5	7·6	2·6	13·6	4·6
17	5 04·3	5 05·1	4 50·4	1·7	0·6	7·7	2·6	13·7	4·7
18	5 04·5	5 05·3	4 50·6	1·8	0·6	7·8	2·7	13·8	4·7
19	5 04·8	5 05·6	4 50·9	1·9	0·6	7·9	2·7	13·9	4·7
20	5 05·0	5 05·8	4 51·1	2·0	0·7	8·0	2·7	14·0	4·8
21	5 05·3	5 06·1	4 51·3	2·1	0·7	8·1	2·8	14·1	4·8
22	5 05·5	5 06·3	4 51·6	2·2	0·8	8·2	2·8	14·2	4·9
23	5 05·8	5 06·6	4 51·8	2·3	0·8	8·3	2·8	14·3	4·9
24	5 06·0	5 06·8	4 52·1	2·4	0·8	8·4	2·9	14·4	4·9
25	5 06·3	5 07·1	4 52·3	2·5	0·9	8·5	2·9	14·5	5·0
26	5 06·5	5 07·3	4 52·5	2·6	0·9	8·6	2·9	14·6	5·0
27	5 06·8	5 07·6	4 52·8	2·7	0·9	8·7	3·0	14·7	5·0
28	5 07·0	5 07·8	4 53·0	2·8	1·0	8·8	3·0	14·8	5·1
29	5 07·3	5 08·1	4 53·3	2·9	1·0	8·9	3·0	14·9	5·1
30	5 07·5	5 08·3	4 53·5	3·0	1·0	9·0	3·1	15·0	5·1
31	5 07·8	5 08·6	4 53·7	3·1	1·1	9·1	3·1	15·1	5·2
32	5 08·0	5 08·8	4 54·0	3·2	1·1	9·2	3·1	15·2	5·2
33	5 08·3	5 09·1	4 54·2	3·3	1·1	9·3	3·2	15·3	5·2
34	5 08·5	5 09·3	4 54·4	3·4	1·2	9·4	3·2	15·4	5·3
35	5 08·8	5 09·6	4 54·7	3·5	1·2	9·5	3·2	15·5	5·3
36	5 09·0	5 09·8	4 54·9	3·6	1·2	9·6	3·3	15·6	5·3
37	5 09·3	5 10·1	4 55·2	3·7	1·3	9·7	3·3	15·7	5·4
38	5 09·5	5 10·3	4 55·4	3·8	1·3	9·8	3·3	15·8	5·4
39	5 09·8	5 10·6	4 55·6	3·9	1·3	9·9	3·4	15·9	5·4
40	5 10·0	5 10·8	4 55·9	4·0	1·4	10·0	3·4	16·0	5·5
41	5 10·3	5 11·1	4 56·1	4·1	1·4	10·1	3·5	16·1	5·5
42	5 10·5	5 11·4	4 56·4	4·2	1·4	10·2	3·5	16·2	5·5
43	5 10·8	5 11·6	4 56·6	4·3	1·5	10·3	3·5	16·3	5·6
44	5 11·0	5 11·9	4 56·8	4·4	1·5	10·4	3·6	16·4	5·6
45	5 11·3	5 12·1	4 57·1	4·5	1·5	10·5	3·6	16·5	5·6
46	5 11·5	5 12·4	4 57·3	4·6	1·6	10·6	3·6	16·6	5·7
47	5 11·8	5 12·6	4 57·5	4·7	1·6	10·7	3·7	16·7	5·7
48	5 12·0	5 12·9	4 57·8	4·8	1·6	10·8	3·7	16·8	5·7
49	5 12·3	5 13·1	4 58·0	4·9	1·7	10·9	3·7	16·9	5·8
50	5 12·5	5 13·4	4 58·3	5·0	1·7	11·0	3·8	17·0	5·8
51	5 12·8	5 13·6	4 58·5	5·1	1·7	11·1	3·8	17·1	5·8
52	5 13·0	5 13·9	4 58·7	5·2	1·8	11·2	3·8	17·2	5·9
53	5 13·3	5 14·1	4 59·0	5·3	1·8	11·3	3·9	17·3	5·9
54	5 13·5	5 14·4	4 59·2	5·4	1·8	11·4	3·9	17·4	5·9
55	5 13·8	5 14·6	4 59·5	5·5	1·9	11·5	3·9	17·5	6·0
56	5 14·0	5 14·9	4 59·7	5·6	1·9	11·6	4·0	17·6	6·0
57	5 14·3	5 15·1	4 59·9	5·7	1·9	11·7	4·0	17·7	6·0
58	5 14·5	5 15·4	5 00·2	5·8	2·0	11·8	4·0	17·8	6·1
59	5 14·8	5 15·6	5 00·4	5·9	2·0	11·9	4·1	17·9	6·1
60	5 15·0	5 15·9	5 00·7	6·0	2·1	12·0	4·1	18·0	6·2

21^{m}	SUN PLANETS	ARIES	MOON	*v* or *d*	Corr^{n}	*v* or *d*	Corr^{n}	*v* or *d*	Corr^{n}
s	° ′	° ′	° ′	′	′	′	′	′	′
00	5 15·0	5 15·9	5 00·7	0·0	0·0	6·0	2·2	12·0	4·3
01	5 15·3	5 16·1	5 00·9	0·1	0·0	6·1	2·2	12·1	4·3
02	5 15·5	5 16·4	5 01·1	0·2	0·1	6·2	2·2	12·2	4·4
03	5 15·8	5 16·6	5 01·4	0·3	0·1	6·3	2·3	12·3	4·4
04	5 16·0	5 16·9	5 01·6	0·4	0·1	6·4	2·3	12·4	4·4
05	5 16·3	5 17·1	5 01·8	0·5	0·2	6·5	2·3	12·5	4·5
06	5 16·5	5 17·4	5 02·1	0·6	0·2	6·6	2·4	12·6	4·5
07	5 16·8	5 17·6	5 02·3	0·7	0·3	6·7	2·4	12·7	4·6
08	5 17·0	5 17·9	5 02·6	0·8	0·3	6·8	2·4	12·8	4·6
09	5 17·3	5 18·1	5 02·8	0·9	0·3	6·9	2·5	12·9	4·6
10	5 17·5	5 18·4	5 03·0	1·0	0·4	7·0	2·5	13·0	4·7
11	5 17·8	5 18·6	5 03·3	1·1	0·4	7·1	2·5	13·1	4·7
12	5 18·0	5 18·9	5 03·5	1·2	0·4	7·2	2·6	13·2	4·7
13	5 18·3	5 19·1	5 03·8	1·3	0·5	7·3	2·6	13·3	4·8
14	5 18·5	5 19·4	5 04·0	1·4	0·5	7·4	2·7	13·4	4·8
15	5 18·8	5 19·6	5 04·2	1·5	0·5	7·5	2·7	13·5	4·8
16	5 19·0	5 19·9	5 04·5	1·6	0·6	7·6	2·7	13·6	4·9
17	5 19·3	5 20·1	5 04·7	1·7	0·6	7·7	2·8	13·7	4·9
18	5 19·5	5 20·4	5 04·9	1·8	0·6	7·8	2·8	13·8	4·9
19	5 19·8	5 20·6	5 05·2	1·9	0·7	7·9	2·8	13·9	5·0
20	5 20·0	5 20·9	5 05·4	2·0	0·7	8·0	2·9	14·0	5·0
21	5 20·3	5 21·1	5 05·7	2·1	0·8	8·1	2·9	14·1	5·1
22	5 20·5	5 21·4	5 05·9	2·2	0·8	8·2	2·9	14·2	5·1
23	5 20·8	5 21·6	5 06·1	2·3	0·8	8·3	3·0	14·3	5·1
24	5 21·0	5 21·9	5 06·4	2·4	0·9	8·4	3·0	14·4	5·2
25	5 21·3	5 22·1	5 06·6	2·5	0·9	8·5	3·0	14·5	5·2
26	5 21·5	5 22·4	5 06·9	2·6	0·9	8·6	3·1	14·6	5·2
27	5 21·8	5 22·6	5 07·1	2·7	1·0	8·7	3·1	14·7	5·3
28	5 22·0	5 22·9	5 07·3	2·8	1·0	8·8	3·2	14·8	5·3
29	5 22·3	5 23·1	5 07·6	2·9	1·0	8·9	3·2	14·9	5·3
30	5 22·5	5 23·4	5 07·8	3·0	1·1	9·0	3·2	15·0	5·4
31	5 22·8	5 23·6	5 08·0	3·1	1·1	9·1	3·3	15·1	5·4
32	5 23·0	5 23·9	5 08·3	3·2	1·1	9·2	3·3	15·2	5·4
33	5 23·3	5 24·1	5 08·5	3·3	1·2	9·3	3·3	15·3	5·5
34	5 23·5	5 24·4	5 08·8	3·4	1·2	9·4	3·4	15·4	5·5
35	5 23·8	5 24·6	5 09·0	3·5	1·3	9·5	3·4	15·5	5·6
36	5 24·0	5 24·9	5 09·2	3·6	1·3	9·6	3·4	15·6	5·6
37	5 24·3	5 25·1	5 09·5	3·7	1·3	9·7	3·5	15·7	5·6
38	5 24·5	5 25·4	5 09·7	3·8	1·4	9·8	3·5	15·8	5·7
39	5 24·8	5 25·6	5 10·0	3·9	1·4	9·9	3·5	15·9	5·7
40	5 25·0	5 25·9	5 10·2	4·0	1·4	10·0	3·6	16·0	5·7
41	5 25·3	5 26·1	5 10·4	4·1	1·5	10·1	3·6	16·1	5·8
42	5 25·5	5 26·4	5 10·7	4·2	1·5	10·2	3·7	16·2	5·8
43	5 25·8	5 26·6	5 10·9	4·3	1·5	10·3	3·7	16·3	5·8
44	5 26·0	5 26·9	5 11·1	4·4	1·6	10·4	3·7	16·4	5·9
45	5 26·3	5 27·1	5 11·4	4·5	1·6	10·5	3·8	16·5	5·9
46	5 26·5	5 27·4	5 11·6	4·6	1·6	10·6	3·8	16·6	5·9
47	5 26·8	5 27·6	5 11·9	4·7	1·7	10·7	3·8	16·7	6·0
48	5 27·0	5 27·9	5 12·1	4·8	1·7	10·8	3·9	16·8	6·0
49	5 27·3	5 28·1	5 12·3	4·9	1·8	10·9	3·9	16·9	6·1
50	5 27·5	5 28·4	5 12·6	5·0	1·8	11·0	3·9	17·0	6·1
51	5 27·8	5 28·6	5 12·8	5·1	1·8	11·1	4·0	17·1	6·1
52	5 28·0	5 28·9	5 13·1	5·2	1·9	11·2	4·0	17·2	6·2
53	5 28·3	5 29·1	5 13·3	5·3	1·9	11·3	4·0	17·3	6·2
54	5 28·5	5 29·4	5 13·5	5·4	1·9	11·4	4·1	17·4	6·2
55	5 28·8	5 29·7	5 13·8	5·5	2·0	11·5	4·1	17·5	6·3
56	5 29·0	5 29·9	5 14·0	5·6	2·0	11·6	4·2	17·6	6·3
57	5 29·3	5 30·2	5 14·3	5·7	2·0	11·7	4·2	17·7	6·3
58	5 29·5	5 30·4	5 14·5	5·8	2·1	11·8	4·2	17·8	6·4
59	5 29·8	5 30·7	5 14·7	5·9	2·1	11·9	4·3	17·9	6·4
60	5 30·0	5 30·9	5 15·0	6·0	2·2	12·0	4·3	18·0	6·5

22^{m}	SUN PLANETS	ARIES	MOON	v or d	Corr^{n}	v or d	Corr^{n}	v or d	Corr^{n}
s	° ′	° ′	° ′	′	′	′	′	′	′
00	5 30·0	5 30·9	5 15·0	0·0	0·0	6·0	2·3	12·0	4·5
01	5 30·3	5 31·2	5 15·2	0·1	0·0	6·1	2·3	12·1	4·5
02	5 30·5	5 31·4	5 15·4	0·2	0·1	6·2	2·3	12·2	4·6
03	5 30·8	5 31·7	5 15·7	0·3	0·1	6·3	2·4	12·3	4·6
04	5 31·0	5 31·9	5 15·9	0·4	0·2	6·4	2·4	12·4	4·7
05	5 31·3	5 32·2	5 16·2	0·5	0·2	6·5	2·4	12·5	4·7
06	5 31·5	5 32·4	5 16·4	0·6	0·2	6·6	2·5	12·6	4·7
07	5 31·8	5 32·7	5 16·6	0·7	0·3	6·7	2·5	12·7	4·8
08	5 32·0	5 32·9	5 16·9	0·8	0·3	6·8	2·6	12·8	4·8
09	5 32·3	5 33·2	5 17·1	0·9	0·3	6·9	2·6	12·9	4·8
10	5 32·5	5 33·4	5 17·4	1·0	0·4	7·0	2·6	13·0	4·9
11	5 32·8	5 33·7	5 17·6	1·1	0·4	7·1	2·7	13·1	4·9
12	5 33·0	5 33·9	5 17·8	1·2	0·5	7·2	2·7	13·2	5·0
13	5 33·3	5 34·2	5 18·1	1·3	0·5	7·3	2·7	13·3	5·0
14	5 33·5	5 34·4	5 18·3	1·4	0·5	7·4	2·8	13·4	5·0
15	5 33·8	5 34·7	5 18·5	1·5	0·6	7·5	2·8	13·5	5·1
16	5 34·0	5 34·9	5 18·8	1·6	0·6	7·6	2·9	13·6	5·1
17	5 34·3	5 35·2	5 19·0	1·7	0·6	7·7	2·9	13·7	5·1
18	5 34·5	5 35·4	5 19·3	1·8	0·7	7·8	2·9	13·8	5·2
19	5 34·8	5 35·7	5 19·5	1·9	0·7	7·9	3·0	13·9	5·2
20	5 35·0	5 35·9	5 19·7	2·0	0·8	8·0	3·0	14·0	5·3
21	5 35·3	5 36·2	5 20·0	2·1	0·8	8·1	3·0	14·1	5·3
22	5 35·5	5 36·4	5 20·2	2·2	0·8	8·2	3·1	14·2	5·3
23	5 35·8	5 36·7	5 20·5	2·3	0·9	8·3	3·1	14·3	5·4
24	5 36·0	5 36·9	5 20·7	2·4	0·9	8·4	3·2	14·4	5·4
25	5 36·3	5 37·2	5 20·9	2·5	0·9	8·5	3·2	14·5	5·4
26	5 36·5	5 37·4	5 21·2	2·6	1·0	8·6	3·2	14·6	5·5
27	5 36·8	5 37·7	5 21·4	2·7	1·0	8·7	3·3	14·7	5·5
28	5 37·0	5 37·9	5 21·6	2·8	1·1	8·8	3·3	14·8	5·6
29	5 37·3	5 38·2	5 21·9	2·9	1·1	8·9	3·3	14·9	5·6
30	5 37·5	5 38·4	5 22·1	3·0	1·1	9·0	3·4	15·0	5·6
31	5 37·8	5 38·7	5 22·4	3·1	1·2	9·1	3·4	15·1	5·7
32	5 38·0	5 38·9	5 22·6	3·2	1·2	9·2	3·5	15·2	5·7
33	5 38·3	5 39·2	5 22·8	3·3	1·2	9·3	3·5	15·3	5·7
34	5 38·5	5 39·4	5 23·1	3·4	1·3	9·4	3·5	15·4	5·8
35	5 38·8	5 39·7	5 23·3	3·5	1·3	9·5	3·6	15·5	5·8
36	5 39·0	5 39·9	5 23·6	3·6	1·4	9·6	3·6	15·6	5·9
37	5 39·3	5 40·2	5 23·8	3·7	1·4	9·7	3·6	15·7	5·9
38	5 39·5	5 40·4	5 24·0	3·8	1·4	9·8	3·7	15·8	5·9
39	5 39·8	5 40·7	5 24·3	3·9	1·5	9·9	3·7	15·9	6·0
40	5 40·0	5 40·9	5 24·5	4·0	1·5	10·0	3·8	16·0	6·0
41	5 40·3	5 41·2	5 24·7	4·1	1·5	10·1	3·8	16·1	6·0
42	5 40·5	5 41·4	5 25·0	4·2	1·6	10·2	3·8	16·2	6·1
43	5 40·8	5 41·7	5 25·2	4·3	1·6	10·3	3·9	16·3	6·1
44	5 41·0	5 41·9	5 25·5	4·4	1·7	10·4	3·9	16·4	6·2
45	5 41·3	5 42·2	5 25·7	4·5	1·7	10·5	3·9	16·5	6·2
46	5 41·5	5 42·4	5 25·9	4·6	1·7	10·6	4·0	16·6	6·2
47	5 41·8	5 42·7	5 26·2	4·7	1·8	10·7	4·0	16·7	6·3
48	5 42·0	5 42·9	5 26·4	4·8	1·8	10·8	4·1	16·8	6·3
49	5 42·3	5 43·2	5 26·7	4·9	1·8	10·9	4·1	16·9	6·3
50	5 42·5	5 43·4	5 26·9	5·0	1·9	11·0	4·1	17·0	6·4
51	5 42·8	5 43·7	5 27·1	5·1	1·9	11·1	4·2	17·1	6·4
52	5 43·0	5 43·9	5 27·4	5·2	2·0	11·2	4·2	17·2	6·5
53	5 43·3	5 44·2	5 27·6	5·3	2·0	11·3	4·2	17·3	6·5
54	5 43·5	5 44·4	5 27·9	5·4	2·0	11·4	4·3	17·4	6·5
55	5 43·8	5 44·7	5 28·1	5·5	2·1	11·5	4·3	17·5	6·6
56	5 44·0	5 44·9	5 28·3	5·6	2·1	11·6	4·4	17·6	6·6
57	5 44·3	5 45·2	5 28·6	5·7	2·1	11·7	4·4	17·7	6·6
58	5 44·5	5 45·4	5 28·8	5·8	2·2	11·8	4·4	17·8	6·7
59	5 44·8	5 45·7	5 29·0	5·9	2·2	11·9	4·5	17·9	6·7
60	5 45·0	5 45·9	5 29·3	6·0	2·3	12·0	4·5	18·0	6·8

23^{m}	SUN PLANETS	ARIES	MOON	v or d	Corr^{n}	v or d	Corr^{n}	v or d	Corr^{n}
s	° ′	° ′	° ′	′	′	′	′	′	′
00	5 45·0	5 45·9	5 29·3	0·0	0·0	6·0	2·4	12·0	4·7
01	5 45·3	5 46·2	5 29·5	0·1	0·0	6·1	2·4	12·1	4·7
02	5 45·5	5 46·4	5 29·8	0·2	0·1	6·2	2·4	12·2	4·8
03	5 45·8	5 46·7	5 30·0	0·3	0·1	6·3	2·5	12·3	4·8
04	5 46·0	5 46·9	5 30·2	0·4	0·2	6·4	2·5	12·4	4·9
05	5 46·3	5 47·2	5 30·5	0·5	0·2	6·5	2·5	12·5	4·9
06	5 46·5	5 47·4	5 30·7	0·6	0·2	6·6	2·6	12·6	4·9
07	5 46·8	5 47·7	5 31·0	0·7	0·3	6·7	2·6	12·7	5·0
08	5 47·0	5 48·0	5 31·2	0·8	0·3	6·8	2·7	12·8	5·0
09	5 47·3	5 48·2	5 31·4	0·9	0·4	6·9	2·7	12·9	5·1
10	5 47·5	5 48·5	5 31·7	1·0	0·4	7·0	2·7	13·0	5·1
11	5 47·8	5 48·7	5 31·9	1·1	0·4	7·1	2·8	13·1	5·1
12	5 48·0	5 49·0	5 32·1	1·2	0·5	7·2	2·8	13·2	5·2
13	5 48·3	5 49·2	5 32·4	1·3	0·5	7·3	2·9	13·3	5·2
14	5 48·5	5 49·5	5 32·6	1·4	0·5	7·4	2·9	13·4	5·2
15	5 48·8	5 49·7	5 32·9	1·5	0·6	7·5	2·9	13·5	5·3
16	5 49·0	5 50·0	5 33·1	1·6	0·6	7·6	3·0	13·6	5·3
17	5 49·3	5 50·2	5 33·3	1·7	0·7	7·7	3·0	13·7	5·4
18	5 49·5	5 50·5	5 33·6	1·8	0·7	7·8	3·1	13·8	5·4
19	5 49·8	5 50·7	5 33·8	1·9	0·7	7·9	3·1	13·9	5·4
20	5 50·0	5 51·0	5 34·1	2·0	0·8	8·0	3·1	14·0	5·5
21	5 50·3	5 51·2	5 34·3	2·1	0·8	8·1	3·2	14·1	5·5
22	5 50·5	5 51·5	5 34·5	2·2	0·9	8·2	3·2	14·2	5·6
23	5 50·8	5 51·7	5 34·8	2·3	0·9	8·3	3·3	14·3	5·6
24	5 51·0	5 52·0	5 35·0	2·4	0·9	8·4	3·3	14·4	5·6
25	5 51·3	5 52·2	5 35·2	2·5	1·0	8·5	3·3	14·5	5·7
26	5 51·5	5 52·5	5 35·5	2·6	1·0	8·6	3·4	14·6	5·7
27	5 51·8	5 52·7	5 35·7	2·7	1·1	8·7	3·4	14·7	5·8
28	5 52·0	5 53·0	5 36·0	2·8	1·1	8·8	3·4	14·8	5·8
29	5 52·3	5 53·2	5 36·2	2·9	1·1	8·9	3·5	14·9	5·8
30	5 52·5	5 53·5	5 36·4	3·0	1·2	9·0	3·5	15·0	5·9
31	5 52·8	5 53·7	5 36·7	3·1	1·2	9·1	3·6	15·1	5·9
32	5 53·0	5 54·0	5 36·9	3·2	1·3	9·2	3·6	15·2	6·0
33	5 53·3	5 54·2	5 37·2	3·3	1·3	9·3	3·6	15·3	6·0
34	5 53·5	5 54·5	5 37·4	3·4	1·3	9·4	3·7	15·4	6·0
35	5 53·8	5 54·7	5 37·6	3·5	1·4	9·5	3·7	15·5	6·1
36	5 54·0	5 55·0	5 37·9	3·6	1·4	9·6	3·8	15·6	6·1
37	5 54·3	5 55·2	5 38·1	3·7	1·4	9·7	3·8	15·7	6·1
38	5 54·5	5 55·5	5 38·4	3·8	1·5	9·8	3·8	15·8	6·2
39	5 54·8	5 55·7	5 38·6	3·9	1·5	9·9	3·9	15·9	6·2
40	5 55·0	5 56·0	5 38·8	4·0	1·6	10·0	3·9	16·0	6·3
41	5 55·3	5 56·2	5 39·1	4·1	1·6	10·1	4·0	16·1	6·3
42	5 55·5	5 56·5	5 39·3	4·2	1·6	10·2	4·0	16·2	6·3
43	5 55·8	5 56·7	5 39·5	4·3	1·7	10·3	4·0	16·3	6·4
44	5 56·0	5 57·0	5 39·8	4·4	1·7	10·4	4·1	16·4	6·4
45	5 56·3	5 57·2	5 40·0	4·5	1·8	10·5	4·1	16·5	6·5
46	5 56·5	5 57·5	5 40·3	4·6	1·8	10·6	4·2	16·6	6·5
47	5 56·8	5 57·7	5 40·5	4·7	1·8	10·7	4·2	16·7	6·5
48	5 57·0	5 58·0	5 40·7	4·8	1·9	10·8	4·2	16·8	6·6
49	5 57·3	5 58·2	5 41·0	4·9	1·9	10·9	4·3	16·9	6·6
50	5 57·5	5 58·5	5 41·2	5·0	2·0	11·0	4·3	17·0	6·7
51	5 57·8	5 58·7	5 41·5	5·1	2·0	11·1	4·3	17·1	6·7
52	5 58·0	5 59·0	5 41·7	5·2	2·0	11·2	4·4	17·2	6·7
53	5 58·3	5 59·2	5 41·9	5·3	2·1	11·3	4·4	17·3	6·8
54	5 58·5	5 59·5	5 42·2	5·4	2·1	11·4	4·5	17·4	6·8
55	5 58·8	5 59·7	5 42·4	5·5	2·2	11·5	4·5	17·5	6·9
56	5 59·0	6 00·0	5 42·6	5·6	2·2	11·6	4·5	17·6	6·9
57	5 59·3	6 00·2	5 42·9	5·7	2·2	11·7	4·6	17·7	6·9
58	5 59·5	6 00·5	5 43·1	5·8	2·3	11·8	4·6	17·8	7·0
59	5 59·8	6 00·7	5 43·4	5·9	2·3	11·9	4·7	17·9	7·0
60	6 00·0	6 01·0	5 43·6	6·0	2·4	12·0	4·7	18·0	7·1

ᵐ 24	SUN PLANETS	ARIES	MOON	*v* or *d*	Corrⁿ	*v* or *d*	Corrⁿ	*v* or *d*	Corrⁿ
s	° ′	° ′	° ′	′	′	′	′	′	′
00	6 00·0	6 01·0	5 43·6	0·0	0·0	6·0	2·5	12·0	4·9
01	6 00·3	6 01·2	5 43·8	0·1	0·0	6·1	2·5	12·1	4·9
02	6 00·5	6 01·5	5 44·1	0·2	0·1	6·2	2·5	12·2	5·0
03	6 00·8	6 01·7	5 44·3	0·3	0·1	6·3	2·6	12·3	5·0
04	6 01·0	6 02·0	5 44·6	0·4	0·2	6·4	2·6	12·4	5·1
05	6 01·3	6 02·2	5 44·8	0·5	0·2	6·5	2·7	12·5	5·1
06	6 01·5	6 02·5	5 45·0	0·6	0·2	6·6	2·7	12·6	5·1
07	6 01·8	6 02·7	5 45·3	0·7	0·3	6·7	2·7	12·7	5·2
08	6 02·0	6 03·0	5 45·5	0·8	0·3	6·8	2·8	12·8	5·2
09	6 02·3	6 03·2	5 45·7	0·9	0·4	6·9	2·8	12·9	5·3
10	6 02·5	6 03·5	5 46·0	1·0	0·4	7·0	2·9	13·0	5·3
11	6 02·8	6 03·7	5 46·2	1·1	0·4	7·1	2·9	13·1	5·3
12	6 03·0	6 04·0	5 46·5	1·2	0·5	7·2	2·9	13·2	5·4
13	6 03·3	6 04·2	5 46·7	1·3	0·5	7·3	3·0	13·3	5·4
14	6 03·5	6 04·5	5 46·9	1·4	0·6	7·4	3·0	13·4	5·5
15	6 03·8	6 04·7	5 47·2	1·5	0·6	7·5	3·1	13·5	5·5
16	6 04·0	6 05·0	5 47·4	1·6	0·7	7·6	3·1	13·6	5·6
17	6 04·3	6 05·2	5 47·7	1·7	0·7	7·7	3·1	13·7	5·6
18	6 04·5	6 05·5	5 47·9	1·8	0·7	7·8	3·2	13·8	5·6
19	6 04·8	6 05·7	5 48·1	1·9	0·8	7·9	3·2	13·9	5·7
20	6 05·0	6 06·0	5 48·4	2·0	0·8	8·0	3·3	14·0	5·7
21	6 05·3	6 06·3	5 48·6	2·1	0·9	8·1	3·3	14·1	5·8
22	6 05·5	6 06·5	5 48·8	2·2	0·9	8·2	3·3	14·2	5·8
23	6 05·8	6 06·8	5 49·1	2·3	0·9	8·3	3·4	14·3	5·8
24	6 06·0	6 07·0	5 49·3	2·4	1·0	8·4	3·4	14·4	5·9
25	6 06·3	6 07·3	5 49·6	2·5	1·0	8·5	3·5	14·5	5·9
26	6 06·5	6 07·5	5 49·8	2·6	1·1	8·6	3·5	14·6	6·0
27	6 06·8	6 07·8	5 50·0	2·7	1·1	8·7	3·6	14·7	6·0
28	6 07·0	6 08·0	5 50·3	2·8	1·1	8·8	3·6	14·8	6·0
29	6 07·3	6 08·3	5 50·5	2·9	1·2	8·9	3·6	14·9	6·1
30	6 07·5	6 08·5	5 50·8	3·0	1·2	9·0	3·7	15·0	6·1
31	6 07·8	6 08·8	5 51·0	3·1	1·3	9·1	3·7	15·1	6·2
32	6 08·0	6 09·0	5 51·2	3·2	1·3	9·2	3·8	15·2	6·2
33	6 08·3	6 09·3	5 51·5	3·3	1·3	9·3	3·8	15·3	6·2
34	6 08·5	6 09·5	5 51·7	3·4	1·4	9·4	3·8	15·4	6·3
35	6 08·8	6 09·8	5 52·0	3·5	1·4	9·5	3·9	15·5	6·3
36	6 09·0	6 10·0	5 52·2	3·6	1·5	9·6	3·9	15·6	6·4
37	6 09·3	6 10·3	5 52·4	3·7	1·5	9·7	4·0	15·7	6·4
38	6 09·5	6 10·5	5 52·7	3·8	1·6	9·8	4·0	15·8	6·5
39	6 09·8	6 10·8	5 52·9	3·9	1·6	9·9	4·0	15·9	6·5
40	6 10·0	6 11·0	5 53·1	4·0	1·6	10·0	4·1	16·0	6·5
41	6 10·3	6 11·3	5 53·4	4·1	1·7	10·1	4·1	16·1	6·6
42	6 10·5	6 11·5	5 53·6	4·2	1·7	10·2	4·2	16·2	6·6
43	6 10·8	6 11·8	5 53·9	4·3	1·8	10·3	4·2	16·3	6·7
44	6 11·0	6 12·0	5 54·1	4·4	1·8	10·4	4·2	16·4	6·7
45	6 11·3	6 12·3	5 54·3	4·5	1·8	10·5	4·3	16·5	6·7
46	6 11·5	6 12·5	5 54·6	4·6	1·9	10·6	4·3	16·6	6·8
47	6 11·8	6 12·8	5 54·8	4·7	1·9	10·7	4·4	16·7	6·8
48	6 12·0	6 13·0	5 55·1	4·8	2·0	10·8	4·4	16·8	6·9
49	6 12·3	6 13·3	5 55·3	4·9	2·0	10·9	4·5	16·9	6·9
50	6 12·5	6 13·5	5 55·5	5·0	2·0	11·0	4·5	17·0	6·9
51	6 12·8	6 13·8	5 55·8	5·1	2·1	11·1	4·5	17·1	7·0
52	6 13·0	6 14·0	5 56·0	5·2	2·1	11·2	4·6	17·2	7·0
53	6 13·3	6 14·3	5 56·2	5·3	2·2	11·3	4·6	17·3	7·1
54	6 13·5	6 14·5	5 56·5	5·4	2·2	11·4	4·7	17·4	7·1
55	6 13·8	6 14·8	5 56·7	5·5	2·2	11·5	4·7	17·5	7·1
56	6 14·0	6 15·0	5 57·0	5·6	2·3	11·6	4·7	17·6	7·2
57	6 14·3	6 15·3	5 57·2	5·7	2·3	11·7	4·8	17·7	7·2
58	6 14·5	6 15·5	5 57·4	5·8	2·4	11·8	4·8	17·8	7·3
59	6 14·8	6 15·8	5 57·7	5·9	2·4	11·9	4·9	17·9	7·3
60	6 15·0	6 16·0	5 57·9	6·0	2·5	12·0	4·9	18·0	7·4

ᵐ 25	SUN PLANETS	ARIES	MOON	*v* or *d*	Corrⁿ	*v* or *d*	Corrⁿ	*v* or *d*	Corrⁿ
s	° ′	° ′	° ′	′	′	′	′	′	′
00	6 15·0	6 16·0	5 57·9	0·0	0·0	6·0	2·6	12·0	5·1
01	6 15·3	6 16·3	5 58·2	0·1	0·0	6·1	2·6	12·1	5·1
02	6 15·5	6 16·5	5 58·4	0·2	0·1	6·2	2·6	12·2	5·2
03	6 15·8	6 16·8	5 58·6	0·3	0·1	6·3	2·7	12·3	5·2
04	6 16·0	6 17·0	5 58·9	0·4	0·2	6·4	2·7	12·4	5·3
05	6 16·3	6 17·3	5 59·1	0·5	0·2	6·5	2·8	12·5	5·3
06	6 16·5	6 17·5	5 59·3	0·6	0·3	6·6	2·8	12·6	5·4
07	6 16·8	6 17·8	5 59·6	0·7	0·3	6·7	2·8	12·7	5·4
08	6 17·0	6 18·0	5 59·8	0·8	0·3	6·8	2·9	12·8	5·4
09	6 17·3	6 18·3	6 00·1	0·9	0·4	6·9	2·9	12·9	5·5
10	6 17·5	6 18·5	6 00·3	1·0	0·4	7·0	3·0	13·0	5·5
11	6 17·8	6 18·8	6 00·5	1·1	0·5	7·1	3·0	13·1	5·6
12	6 18·0	6 19·0	6 00·8	1·2	0·5	7·2	3·1	13·2	5·6
13	6 18·3	6 19·3	6 01·0	1·3	0·6	7·3	3·1	13·3	5·7
14	6 18·5	6 19·5	6 01·3	1·4	0·6	7·4	3·1	13·4	5·7
15	6 18·8	6 19·8	6 01·5	1·5	0·6	7·5	3·2	13·5	5·7
16	6 19·0	6 20·0	6 01·7	1·6	0·7	7·6	3·2	13·6	5·8
17	6 19·3	6 20·3	6 02·0	1·7	0·7	7·7	3·3	13·7	5·8
18	6 19·5	6 20·5	6 02·2	1·8	0·8	7·8	3·3	13·8	5·9
19	6 19·8	6 20·8	6 02·5	1·9	0·8	7·9	3·4	13·9	5·9
20	6 20·0	6 21·0	6 02·7	2·0	0·9	8·0	3·4	14·0	6·0
21	6 20·3	6 21·3	6 02·9	2·1	0·9	8·1	3·4	14·1	6·0
22	6 20·5	6 21·5	6 03·2	2·2	0·9	8·2	3·5	14·2	6·0
23	6 20·8	6 21·8	6 03·4	2·3	1·0	8·3	3·5	14·3	6·1
24	6 21·0	6 22·0	6 03·6	2·4	1·0	8·4	3·6	14·4	6·1
25	6 21·3	6 22·3	6 03·9	2·5	1·1	8·5	3·6	14·5	6·2
26	6 21·5	6 22·5	6 04·1	2·6	1·1	8·6	3·7	14·6	6·2
27	6 21·8	6 22·8	6 04·4	2·7	1·1	8·7	3·7	14·7	6·2
28	6 22·0	6 23·0	6 04·6	2·8	1·2	8·8	3·7	14·8	6·3
29	6 22·3	6 23·3	6 04·8	2·9	1·2	8·9	3·8	14·9	6·3
30	6 22·5	6 23·5	6 05·1	3·0	1·3	9·0	3·8	15·0	6·4
31	6 22·8	6 23·8	6 05·3	3·1	1·3	9·1	3·9	15·1	6·4
32	6 23·0	6 24·0	6 05·6	3·2	1·4	9·2	3·9	15·2	6·5
33	6 23·3	6 24·3	6 05·8	3·3	1·4	9·3	4·0	15·3	6·5
34	6 23·5	6 24·5	6 06·0	3·4	1·4	9·4	4·0	15·4	6·5
35	6 23·8	6 24·8	6 06·3	3·5	1·5	9·5	4·0	15·5	6·6
36	6 24·0	6 25·1	6 06·5	3·6	1·5	9·6	4·1	15·6	6·6
37	6 24·3	6 25·3	6 06·7	3·7	1·6	9·7	4·1	15·7	6·7
38	6 24·5	6 25·6	6 07·0	3·8	1·6	9·8	4·2	15·8	6·7
39	6 24·8	6 25·8	6 07·2	3·9	1·7	9·9	4·2	15·9	6·8
40	6 25·0	6 26·1	6 07·5	4·0	1·7	10·0	4·3	16·0	6·8
41	6 25·3	6 26·3	6 07·7	4·1	1·7	10·1	4·3	16·1	6·8
42	6 25·5	6 26·6	6 07·9	4·2	1·8	10·2	4·3	16·2	6·9
43	6 25·8	6 26·8	6 08·2	4·3	1·8	10·3	4·4	16·3	6·9
44	6 26·0	6 27·1	6 08·4	4·4	1·9	10·4	4·4	16·4	7·0
45	6 26·3	6 27·3	6 08·7	4·5	1·9	10·5	4·5	16·5	7·0
46	6 26·5	6 27·6	6 08·9	4·6	2·0	10·6	4·5	16·6	7·1
47	6 26·8	6 27·8	6 09·1	4·7	2·0	10·7	4·5	16·7	7·1
48	6 27·0	6 28·1	6 09·4	4·8	2·0	10·8	4·6	16·8	7·1
49	6 27·3	6 28·3	6 09·6	4·9	2·1	10·9	4·6	16·9	7·2
50	6 27·5	6 28·6	6 09·8	5·0	2·1	11·0	4·7	17·0	7·2
51	6 27·8	6 28·8	6 10·1	5·1	2·2	11·1	4·7	17·1	7·3
52	6 28·0	6 29·1	6 10·3	5·2	2·2	11·2	4·8	17·2	7·3
53	6 28·3	6 29·3	6 10·6	5·3	2·3	11·3	4·8	17·3	7·4
54	6 28·5	6 29·6	6 10·8	5·4	2·3	11·4	4·8	17·4	7·4
55	6 28·8	6 29·8	6 11·0	5·5	2·3	11·5	4·9	17·5	7·4
56	6 29·0	6 30·1	6 11·3	5·6	2·4	11·6	4·9	17·6	7·5
57	6 29·3	6 30·3	6 11·5	5·7	2·4	11·7	5·0	17·7	7·5
58	6 29·5	6 30·6	6 11·8	5·8	2·5	11·8	5·0	17·8	7·6
59	6 29·8	6 30·8	6 12·0	5·9	2·5	11·9	5·1	17·9	7·6
60	6 30·0	6 31·1	6 12·2	6·0	2·6	12·0	5·1	18·0	7·7

26^{m}	SUN PLANETS	ARIES	MOON	v or d	Corrⁿ	v or d	Corrⁿ	v or d	Corrⁿ
s	° ′	° ′	° ′	′	′	′	′	′	′
00	6 30·0	6 31·1	6 12·2	0·0	0·0	6·0	2·7	12·0	5·3
01	6 30·3	6 31·3	6 12·5	0·1	0·0	6·1	2·7	12·1	5·3
02	6 30·5	6 31·6	6 12·7	0·2	0·1	6·2	2·7	12·2	5·4
03	6 30·8	6 31·8	6 12·9	0·3	0·1	6·3	2·8	12·3	5·4
04	6 31·0	6 32·1	6 13·2	0·4	0·2	6·4	2·8	12·4	5·5
05	6 31·3	6 32·3	6 13·4	0·5	0·2	6·5	2·9	12·5	5·5
06	6 31·5	6 32·6	6 13·7	0·6	0·3	6·6	2·9	12·6	5·6
07	6 31·8	6 32·8	6 13·9	0·7	0·3	6·7	3·0	12·7	5·6
08	6 32·0	6 33·1	6 14·1	0·8	0·4	6·8	3·0	12·8	5·7
09	6 32·3	6 33·3	6 14·4	0·9	0·4	6·9	3·0	12·9	5·7
10	6 32·5	6 33·6	6 14·6	1·0	0·4	7·0	3·1	13·0	5·7
11	6 32·8	6 33·8	6 14·9	1·1	0·5	7·1	3·1	13·1	5·8
12	6 33·0	6 34·1	6 15·1	1·2	0·5	7·2	3·2	13·2	5·8
13	6 33·3	6 34·3	6 15·3	1·3	0·6	7·3	3·2	13·3	5·9
14	6 33·5	6 34·6	6 15·6	1·4	0·6	7·4	3·3	13·4	5·9
15	6 33·8	6 34·8	6 15·8	1·5	0·7	7·5	3·3	13·5	6·0
16	6 34·0	6 35·1	6 16·1	1·6	0·7	7·6	3·4	13·6	6·0
17	6 34·3	6 35·3	6 16·3	1·7	0·8	7·7	3·4	13·7	6·1
18	6 34·5	6 35·6	6 16·5	1·8	0·8	7·8	3·4	13·8	6·1
19	6 34·8	6 35·8	6 16·8	1·9	0·8	7·9	3·5	13·9	6·1
20	6 35·0	6 36·1	6 17·0	2·0	0·9	8·0	3·5	14·0	6·2
21	6 35·3	6 36·3	6 17·2	2·1	0·9	8·1	3·6	14·1	6·2
22	6 35·5	6 36·6	6 17·5	2·2	1·0	8·2	3·6	14·2	6·3
23	6 35·8	6 36·8	6 17·7	2·3	1·0	8·3	3·7	14·3	6·3
24	6 36·0	6 37·1	6 18·0	2·4	1·1	8·4	3·7	14·4	6·4
25	6 36·3	6 37·3	6 18·2	2·5	1·1	8·5	3·8	14·5	6·4
26	6 36·5	6 37·6	6 18·4	2·6	1·1	8·6	3·8	14·6	6·4
27	6 36·8	6 37·8	6 18·7	2·7	1·2	8·7	3·8	14·7	6·5
28	6 37·0	6 38·1	6 18·9	2·8	1·2	8·8	3·9	14·8	6·5
29	6 37·3	6 38·3	6 19·2	2·9	1·3	8·9	3·9	14·9	6·6
30	6 37·5	6 38·6	6 19·4	3·0	1·3	9·0	4·0	15·0	6·6
31	6 37·8	6 38·8	6 19·6	3·1	1·4	9·1	4·0	15·1	6·7
32	6 38·0	6 39·1	6 19·9	3·2	1·4	9·2	4·1	15·2	6·7
33	6 38·3	6 39·3	6 20·1	3·3	1·5	9·3	4·1	15·3	6·8
34	6 38·5	6 39·6	6 20·3	3·4	1·5	9·4	4·2	15·4	6·8
35	6 38·8	6 39·8	6 20·6	3·5	1·5	9·5	4·2	15·5	6·8
36	6 39·0	6 40·1	6 20·8	3·6	1·6	9·6	4·2	15·6	6·9
37	6 39·3	6 40·3	6 21·1	3·7	1·6	9·7	4·3	15·7	6·9
38	6 39·5	6 40·6	6 21·3	3·8	1·7	9·8	4·3	15·8	7·0
39	6 39·8	6 40·8	6 21·5	3·9	1·7	9·9	4·4	15·9	7·0
40	6 40·0	6 41·1	6 21·8	4·0	1·8	10·0	4·4	16·0	7·1
41	6 40·3	6 41·3	6 22·0	4·1	1·8	10·1	4·5	16·1	7·1
42	6 40·5	6 41·6	6 22·3	4·2	1·9	10·2	4·5	16·2	7·2
43	6 40·8	6 41·8	6 22·5	4·3	1·9	10·3	4·5	16·3	7·2
44	6 41·0	6 42·1	6 22·7	4·4	1·9	10·4	4·6	16·4	7·2
45	6 41·3	6 42·3	6 23·0	4·5	2·0	10·5	4·6	16·5	7·3
46	6 41·5	6 42·6	6 23·2	4·6	2·0	10·6	4·7	16·6	7·3
47	6 41·8	6 42·8	6 23·4	4·7	2·1	10·7	4·7	16·7	7·4
48	6 42·0	6 43·1	6 23·7	4·8	2·1	10·8	4·8	16·8	7·4
49	6 42·3	6 43·4	6 23·9	4·9	2·2	10·9	4·8	16·9	7·5
50	6 42·5	6 43·6	6 24·2	5·0	2·2	11·0	4·9	17·0	7·5
51	6 42·8	6 43·9	6 24·4	5·1	2·3	11·1	4·9	17·1	7·6
52	6 43·0	6 44·1	6 24·6	5·2	2·3	11·2	4·9	17·2	7·6
53	6 43·3	6 44·4	6 24·9	5·3	2·3	11·3	5·0	17·3	7·6
54	6 43·5	6 44·6	6 25·1	5·4	2·4	11·4	5·0	17·4	7·7
55	6 43·8	6 44·9	6 25·4	5·5	2·4	11·5	5·1	17·5	7·7
56	6 44·0	6 45·1	6 25·6	5·6	2·5	11·6	5·1	17·6	7·8
57	6 44·3	6 45·4	6 25·8	5·7	2·5	11·7	5·2	17·7	7·8
58	6 44·5	6 45·6	6 26·1	5·8	2·6	11·8	5·2	17·8	7·9
59	6 44·8	6 45·9	6 26·3	5·9	2·6	11·9	5·3	17·9	7·9
60	6 45·0	6 46·1	6 26·6	6·0	2·7	12·0	5·3	18·0	8·0

27^{m}	SUN PLANETS	ARIES	MOON	v or d	Corrⁿ	v or d	Corrⁿ	v or d	Corrⁿ
s	° ′	° ′	° ′	′	′	′	′	′	′
00	6 45·0	6 46·1	6 26·6	0·0	0·0	6·0	2·8	12·0	5·5
01	6 45·3	6 46·4	6 26·8	0·1	0·0	6·1	2·8	12·1	5·5
02	6 45·5	6 46·6	6 27·0	0·2	0·1	6·2	2·8	12·2	5·6
03	6 45·8	6 46·9	6 27·3	0·3	0·1	6·3	2·9	12·3	5·6
04	6 46·0	6 47·1	6 27·5	0·4	0·2	6·4	2·9	12·4	5·7
05	6 46·3	6 47·4	6 27·7	0·5	0·2	6·5	3·0	12·5	5·7
06	6 46·5	6 47·6	6 28·0	0·6	0·3	6·6	3·0	12·6	5·8
07	6 46·8	6 47·9	6 28·2	0·7	0·3	6·7	3·1	12·7	5·8
08	6 47·0	6 48·1	6 28·5	0·8	0·4	6·8	3·1	12·8	5·9
09	6 47·3	6 48·4	6 28·7	0·9	0·4	6·9	3·2	12·9	5·9
10	6 47·5	6 48·6	6 28·9	1·0	0·5	7·0	3·2	13·0	6·0
11	6 47·8	6 48·9	6 29·2	1·1	0·5	7·1	3·3	13·1	6·0
12	6 48·0	6 49·1	6 29·4	1·2	0·6	7·2	3·3	13·2	6·1
13	6 48·3	6 49·4	6 29·7	1·3	0·6	7·3	3·3	13·3	6·1
14	6 48·5	6 49·6	6 29·9	1·4	0·6	7·4	3·4	13·4	6·1
15	6 48·8	6 49·9	6 30·1	1·5	0·7	7·5	3·4	13·5	6·2
16	6 49·0	6 50·1	6 30·4	1·6	0·7	7·6	3·5	13·6	6·2
17	6 49·3	6 50·4	6 30·6	1·7	0·8	7·7	3·5	13·7	6·3
18	6 49·5	6 50·6	6 30·8	1·8	0·8	7·8	3·6	13·8	6·3
19	6 49·8	6 50·9	6 31·1	1·9	0·9	7·9	3·6	13·9	6·4
20	6 50·0	6 51·1	6 31·3	2·0	0·9	8·0	3·7	14·0	6·4
21	6 50·3	6 51·4	6 31·6	2·1	1·0	8·1	3·7	14·1	6·5
22	6 50·5	6 51·6	6 31·8	2·2	1·0	8·2	3·8	14·2	6·5
23	6 50·8	6 51·9	6 32·0	2·3	1·1	8·3	3·8	14·3	6·6
24	6 51·0	6 52·1	6 32·3	2·4	1·1	8·4	3·9	14·4	6·6
25	6 51·3	6 52·4	6 32·5	2·5	1·1	8·5	3·9	14·5	6·6
26	6 51·5	6 52·6	6 32·8	2·6	1·2	8·6	3·9	14·6	6·7
27	6 51·8	6 52·9	6 33·0	2·7	1·2	8·7	4·0	14·7	6·7
28	6 52·0	6 53·1	6 33·2	2·8	1·3	8·8	4·0	14·8	6·8
29	6 52·3	6 53·4	6 33·5	2·9	1·3	8·9	4·1	14·9	6·8
30	6 52·5	6 53·6	6 33·7	3·0	1·4	9·0	4·1	15·0	6·9
31	6 52·8	6 53·9	6 33·9	3·1	1·4	9·1	4·2	15·1	6·9
32	6 53·0	6 54·1	6 34·2	3·2	1·5	9·2	4·2	15·2	7·0
33	6 53·3	6 54·4	6 34·4	3·3	1·5	9·3	4·3	15·3	7·0
34	6 53·5	6 54·6	6 34·7	3·4	1·6	9·4	4·3	15·4	7·1
35	6 53·8	6 54·9	6 34·9	3·5	1·6	9·5	4·4	15·5	7·1
36	6 54·0	6 55·1	6 35·1	3·6	1·7	9·6	4·4	15·6	7·2
37	6 54·3	6 55·4	6 35·4	3·7	1·7	9·7	4·4	15·7	7·2
38	6 54·5	6 55·6	6 35·6	3·8	1·7	9·8	4·5	15·8	7·2
39	6 54·8	6 55·9	6 35·9	3·9	1·8	9·9	4·5	15·9	7·3
40	6 55·0	6 56·1	6 36·1	4·0	1·8	10·0	4·6	16·0	7·3
41	6 55·3	6 56·4	6 36·3	4·1	1·9	10·1	4·6	16·1	7·4
42	6 55·5	6 56·6	6 36·6	4·2	1·9	10·2	4·7	16·2	7·4
43	6 55·8	6 56·9	6 36·8	4·3	2·0	10·3	4·7	16·3	7·5
44	6 56·0	6 57·1	6 37·0	4·4	2·0	10·4	4·8	16·4	7·5
45	6 56·3	6 57·4	6 37·3	4·5	2·1	10·5	4·8	16·5	7·6
46	6 56·5	6 57·6	6 37·5	4·6	2·1	10·6	4·9	16·6	7·6
47	6 56·8	6 57·9	6 37·8	4·7	2·2	10·7	4·9	16·7	7·7
48	6 57·0	6 58·1	6 38·0	4·8	2·2	10·8	5·0	16·8	7·7
49	6 57·3	6 58·4	6 38·2	4·9	2·2	10·9	5·0	16·9	7·7
50	6 57·5	6 58·6	6 38·5	5·0	2·3	11·0	5·0	17·0	7·8
51	6 57·8	6 58·9	6 38·7	5·1	2·3	11·1	5·1	17·1	7·8
52	6 58·0	6 59·1	6 39·0	5·2	2·4	11·2	5·1	17·2	7·9
53	6 58·3	6 59·4	6 39·2	5·3	2·4	11·3	5·2	17·3	7·9
54	6 58·5	6 59·6	6 39·4	5·4	2·5	11·4	5·2	17·4	8·0
55	6 58·8	6 59·9	6 39·7	5·5	2·5	11·5	5·3	17·5	8·0
56	6 59·0	7 00·1	6 39·9	5·6	2·6	11·6	5·3	17·6	8·1
57	6 59·3	7 00·4	6 40·2	5·7	2·6	11·7	5·4	17·7	8·1
58	6 59·5	7 00·6	6 40·4	5·8	2·7	11·8	5·4	17·8	8·2
59	6 59·8	7 00·9	6 40·6	5·9	2·7	11·9	5·5	17·9	8·2
60	7 00·0	7 01·1	6 40·9	6·0	2·8	12·0	5·5	18·0	8·3

28^m	SUN PLANETS	ARIES	MOON	v or d	Corrⁿ	v or d	Corrⁿ	v or d	Corrⁿ
s	° ′	° ′	° ′	′	′	′	′	′	′
00	7 00·0	7 01·1	6 40·9	0·0	0·0	6·0	2·9	12·0	5·7
01	7 00·3	7 01·4	6 41·1	0·1	0·0	6·1	2·9	12·1	5·7
02	7 00·5	7 01·7	6 41·3	0·2	0·1	6·2	2·9	12·2	5·8
03	7 00·8	7 01·9	6 41·6	0·3	0·1	6·3	3·0	12·3	5·8
04	7 01·0	7 02·2	6 41·8	0·4	0·2	6·4	3·0	12·4	5·9
05	7 01·3	7 02·4	6 42·1	0·5	0·2	6·5	3·1	12·5	5·9
06	7 01·5	7 02·7	6 42·3	0·6	0·3	6·6	3·1	12·6	6·0
07	7 01·8	7 02·9	6 42·5	0·7	0·3	6·7	3·2	12·7	6·0
08	7 02·0	7 03·2	6 42·8	0·8	0·4	6·8	3·2	12·8	6·1
09	7 02·3	7 03·4	6 43·0	0·9	0·4	6·9	3·3	12·9	6·1
10	7 02·5	7 03·7	6 43·3	1·0	0·5	7·0	3·3	13·0	6·2
11	7 02·8	7 03·9	6 43·5	1·1	0·5	7·1	3·4	13·1	6·2
12	7 03·0	7 04·2	6 43·7	1·2	0·6	7·2	3·4	13·2	6·3
13	7 03·3	7 04·4	6 44·0	1·3	0·6	7·3	3·5	13·3	6·3
14	7 03·5	7 04·7	6 44·2	1·4	0·7	7·4	3·5	13·4	6·4
15	7 03·8	7 04·9	6 44·4	1·5	0·7	7·5	3·6	13·5	6·4
16	7 04·0	7 05·2	6 44·7	1·6	0·8	7·6	3·6	13·6	6·5
17	7 04·3	7 05·4	6 44·9	1·7	0·8	7·7	3·7	13·7	6·5
18	7 04·5	7 05·7	6 45·2	1·8	0·9	7·8	3·7	13·8	6·6
19	7 04·8	7 05·9	6 45·4	1·9	0·9	7·9	3·8	13·9	6·6
20	7 05·0	7 06·2	6 45·6	2·0	1·0	8·0	3·8	14·0	6·7
21	7 05·3	7 06·4	6 45·9	2·1	1·0	8·1	3·8	14·1	6·7
22	7 05·5	7 06·7	6 46·1	2·2	1·0	8·2	3·9	14·2	6·7
23	7 05·8	7 06·9	6 46·4	2·3	1·1	8·3	3·9	14·3	6·8
24	7 06·0	7 07·2	6 46·6	2·4	1·1	8·4	4·0	14·4	6·8
25	7 06·3	7 07·4	6 46·8	2·5	1·2	8·5	4·0	14·5	6·9
26	7 06·5	7 07·7	6 47·1	2·6	1·2	8·6	4·1	14·6	6·9
27	7 06·8	7 07·9	6 47·3	2·7	1·3	8·7	4·1	14·7	7·0
28	7 07·0	7 08·2	6 47·5	2·8	1·3	8·8	4·2	14·8	7·0
29	7 07·3	7 08·4	6 47·8	2·9	1·4	8·9	4·2	14·9	7·1
30	7 07·5	7 08·7	6 48·0	3·0	1·4	9·0	4·3	15·0	7·1
31	7 07·8	7 08·9	6 48·3	3·1	1·5	9·1	4·3	15·1	7·2
32	7 08·0	7 09·2	6 48·5	3·2	1·5	9·2	4·4	15·2	7·2
33	7 08·3	7 09·4	6 48·7	3·3	1·6	9·3	4·4	15·3	7·3
34	7 08·5	7 09·7	6 49·0	3·4	1·6	9·4	4·5	15·4	7·3
35	7 08·8	7 09·9	6 49·2	3·5	1·7	9·5	4·5	15·5	7·4
36	7 09·0	7 10·2	6 49·5	3·6	1·7	9·6	4·6	15·6	7·4
37	7 09·3	7 10·4	6 49·7	3·7	1·8	9·7	4·6	15·7	7·5
38	7 09·5	7 10·7	6 49·9	3·8	1·8	9·8	4·7	15·8	7·5
39	7 09·8	7 10·9	6 50·2	3·9	1·9	9·9	4·7	15·9	7·6
40	7 10·0	7 11·2	6 50·4	4·0	1·9	10·0	4·8	16·0	7·6
41	7 10·3	7 11·4	6 50·6	4·1	1·9	10·1	4·8	16·1	7·6
42	7 10·5	7 11·7	6 50·9	4·2	2·0	10·2	4·8	16·2	7·7
43	7 10·8	7 11·9	6 51·1	4·3	2·0	10·3	4·9	16·3	7·7
44	7 11·0	7 12·2	6 51·4	4·4	2·1	10·4	4·9	16·4	7·8
45	7 11·3	7 12·4	6 51·6	4·5	2·1	10·5	5·0	16·5	7·8
46	7 11·5	7 12·7	6 51·8	4·6	2·2	10·6	5·0	16·6	7·9
47	7 11·8	7 12·9	6 52·1	4·7	2·2	10·7	5·1	16·7	7·9
48	7 12·0	7 13·2	6 52·3	4·8	2·3	10·8	5·1	16·8	8·0
49	7 12·3	7 13·4	6 52·6	4·9	2·3	10·9	5·2	16·9	8·0
50	7 12·5	7 13·7	6 52·8	5·0	2·4	11·0	5·2	17·0	8·1
51	7 12·8	7 13·9	6 53·0	5·1	2·4	11·1	5·3	17·1	8·1
52	7 13·0	7 14·2	6 53·3	5·2	2·5	11·2	5·3	17·2	8·2
53	7 13·3	7 14·4	6 53·5	5·3	2·5	11·3	5·4	17·3	8·2
54	7 13·5	7 14·7	6 53·8	5·4	2·6	11·4	5·4	17·4	8·3
55	7 13·8	7 14·9	6 54·0	5·5	2·6	11·5	5·5	17·5	8·3
56	7 14·0	7 15·2	6 54·2	5·6	2·7	11·6	5·5	17·6	8·4
57	7 14·3	7 15·4	6 54·5	5·7	2·7	11·7	5·6	17·7	8·4
58	7 14·5	7 15·7	6 54·7	5·8	2·8	11·8	5·6	17·8	8·5
59	7 14·8	7 15·9	6 54·9	5·9	2·8	11·9	5·7	17·9	8·5
60	7 15·0	7 16·2	6 55·2	6·0	2·9	12·0	5·7	18·0	8·6

29^m	SUN PLANETS	ARIES	MOON	v or d	Corrⁿ	v or d	Corrⁿ	v or d	Corrⁿ
s	° ′	° ′	° ′	′	′	′	′	′	′
00	7 15·0	7 16·2	6 55·2	0·0	0·0	6·0	3·0	12·0	5·9
01	7 15·3	7 16·4	6 55·4	0·1	0·0	6·1	3·0	12·1	5·9
02	7 15·5	7 16·7	6 55·7	0·2	0·1	6·2	3·0	12·2	6·0
03	7 15·8	7 16·9	6 55·9	0·3	0·1	6·3	3·1	12·3	6·0
04	7 16·0	7 17·2	6 56·1	0·4	0·2	6·4	3·1	12·4	6·1
05	7 16·3	7 17·4	6 56·4	0·5	0·2	6·5	3·2	12·5	6·1
06	7 16·5	7 17·7	6 56·6	0·6	0·3	6·6	3·2	12·6	6·2
07	7 16·8	7 17·9	6 56·9	0·7	0·3	6·7	3·3	12·7	6·2
08	7 17·0	7 18·2	6 57·1	0·8	0·4	6·8	3·3	12·8	6·3
09	7 17·3	7 18·4	6 57·3	0·9	0·4	6·9	3·4	12·9	6·3
10	7 17·5	7 18·7	6 57·6	1·0	0·5	7·0	3·4	13·0	6·4
11	7 17·8	7 18·9	6 57·8	1·1	0·5	7·1	3·5	13·1	6·4
12	7 18·0	7 19·2	6 58·0	1·2	0·6	7·2	3·5	13·2	6·5
13	7 18·3	7 19·4	6 58·3	1·3	0·6	7·3	3·6	13·3	6·5
14	7 18·5	7 19·7	6 58·5	1·4	0·7	7·4	3·6	13·4	6·6
15	7 18·8	7 20·0	6 58·8	1·5	0·7	7·5	3·7	13·5	6·6
16	7 19·0	7 20·2	6 59·0	1·6	0·8	7·6	3·7	13·6	6·7
17	7 19·3	7 20·5	6 59·2	1·7	0·8	7·7	3·8	13·7	6·7
18	7 19·5	7 20·7	6 59·5	1·8	0·9	7·8	3·8	13·8	6·8
19	7 19·8	7 21·0	6 59·7	1·9	0·9	7·9	3·9	13·9	6·8
20	7 20·0	7 21·2	7 00·0	2·0	1·0	8·0	3·9	14·0	6·9
21	7 20·3	7 21·5	7 00·2	2·1	1·0	8·1	4·0	14·1	6·9
22	7 20·5	7 21·7	7 00·4	2·2	1·1	8·2	4·0	14·2	7·0
23	7 20·8	7 22·0	7 00·7	2·3	1·1	8·3	4·1	14·3	7·0
24	7 21·0	7 22·2	7 00·9	2·4	1·2	8·4	4·1	14·4	7·1
25	7 21·3	7 22·5	7 01·1	2·5	1·2	8·5	4·2	14·5	7·1
26	7 21·5	7 22·7	7 01·4	2·6	1·3	8·6	4·2	14·6	7·2
27	7 21·8	7 23·0	7 01·6	2·7	1·3	8·7	4·3	14·7	7·2
28	7 22·0	7 23·2	7 01·9	2·8	1·4	8·8	4·3	14·8	7·3
29	7 22·3	7 23·5	7 02·1	2·9	1·4	8·9	4·4	14·9	7·3
30	7 22·5	7 23·7	7 02·3	3·0	1·5	9·0	4·4	15·0	7·4
31	7 22·8	7 24·0	7 02·6	3·1	1·5	9·1	4·5	15·1	7·4
32	7 23·0	7 24·2	7 02·8	3·2	1·6	9·2	4·5	15·2	7·5
33	7 23·3	7 24·5	7 03·1	3·3	1·6	9·3	4·6	15·3	7·5
34	7 23·5	7 24·7	7 03·3	3·4	1·7	9·4	4·6	15·4	7·6
35	7 23·8	7 25·0	7 03·5	3·5	1·7	9·5	4·7	15·5	7·6
36	7 24·0	7 25·2	7 03·8	3·6	1·8	9·6	4·7	15·6	7·7
37	7 24·3	7 25·5	7 04·0	3·7	1·8	9·7	4·8	15·7	7·7
38	7 24·5	7 25·7	7 04·3	3·8	1·9	9·8	4·8	15·8	7·8
39	7 24·8	7 26·0	7 04·5	3·9	1·9	9·9	4·9	15·9	7·8
40	7 25·0	7 26·2	7 04·7	4·0	2·0	10·0	4·9	16·0	7·9
41	7 25·3	7 26·5	7 05·0	4·1	2·0	10·1	5·0	16·1	7·9
42	7 25·5	7 26·7	7 05·2	4·2	2·1	10·2	5·0	16·2	8·0
43	7 25·8	7 27·0	7 05·4	4·3	2·1	10·3	5·1	16·3	8·0
44	7 26·0	7 27·2	7 05·7	4·4	2·2	10·4	5·1	16·4	8·1
45	7 26·3	7 27·5	7 05·9	4·5	2·2	10·5	5·2	16·5	8·1
46	7 26·5	7 27·7	7 06·2	4·6	2·3	10·6	5·2	16·6	8·2
47	7 26·8	7 28·0	7 06·4	4·7	2·3	10·7	5·3	16·7	8·2
48	7 27·0	7 28·2	7 06·6	4·8	2·4	10·8	5·3	16·8	8·3
49	7 27·3	7 28·5	7 06·9	4·9	2·4	10·9	5·4	16·9	8·3
50	7 27·5	7 28·7	7 07·1	5·0	2·5	11·0	5·4	17·0	8·4
51	7 27·8	7 29·0	7 07·4	5·1	2·5	11·1	5·5	17·1	8·4
52	7 28·0	7 29·2	7 07·6	5·2	2·6	11·2	5·5	17·2	8·5
53	7 28·3	7 29·5	7 07·8	5·3	2·6	11·3	5·6	17·3	8·5
54	7 28·5	7 29·7	7 08·1	5·4	2·7	11·4	5·6	17·4	8·6
55	7 28·8	7 30·0	7 08·3	5·5	2·7	11·5	5·7	17·5	8·6
56	7 29·0	7 30·2	7 08·5	5·6	2·8	11·6	5·7	17·6	8·7
57	7 29·3	7 30·5	7 08·8	5·7	2·8	11·7	5·8	17·7	8·7
58	7 29·5	7 30·7	7 09·0	5·8	2·9	11·8	5·8	17·8	8·8
59	7 29·8	7 31·0	7 09·3	5·9	2·9	11·9	5·9	17·9	8·8
60	7 30·0	7 31·2	7 09·5	6·0	3·0	12·0	5·9	18·0	8·9

30m	SUN PLANETS	ARIES	MOON	v or d	Corrn	v or d	Corrn	v or d	Corrn
s	° ′	° ′	° ′	′	′	′	′	′	′
00	7 30·0	7 31·2	7 09·5	0·0	0·0	6·0	3·1	12·0	6·1
01	7 30·3	7 31·5	7 09·7	0·1	0·1	6·1	3·1	12·1	6·2
02	7 30·5	7 31·7	7 10·0	0·2	0·1	6·2	3·2	12·2	6·2
03	7 30·8	7 32·0	7 10·2	0·3	0·2	6·3	3·2	12·3	6·3
04	7 31·0	7 32·2	7 10·5	0·4	0·2	6·4	3·3	12·4	6·3
05	7 31·3	7 32·5	7 10·7	0·5	0·3	6·5	3·3	12·5	6·4
06	7 31·5	7 32·7	7 10·9	0·6	0·3	6·6	3·4	12·6	6·4
07	7 31·8	7 33·0	7 11·2	0·7	0·4	6·7	3·4	12·7	6·5
08	7 32·0	7 33·2	7 11·4	0·8	0·4	6·8	3·5	12·8	6·5
09	7 32·3	7 33·5	7 11·6	0·9	0·5	6·9	3·5	12·9	6·6
10	7 32·5	7 33·7	7 11·9	1·0	0·5	7·0	3·6	13·0	6·6
11	7 32·8	7 34·0	7 12·1	1·1	0·6	7·1	3·6	13·1	6·7
12	7 33·0	7 34·2	7 12·4	1·2	0·6	7·2	3·7	13·2	6·7
13	7 33·3	7 34·5	7 12·6	1·3	0·7	7·3	3·7	13·3	6·8
14	7 33·5	7 34·7	7 12·8	1·4	0·7	7·4	3·8	13·4	6·8
15	7 33·8	7 35·0	7 13·1	1·5	0·8	7·5	3·8	13·5	6·9
16	7 34·0	7 35·2	7 13·3	1·6	0·8	7·6	3·9	13·6	6·9
17	7 34·3	7 35·5	7 13·6	1·7	0·9	7·7	3·9	13·7	7·0
18	7 34·5	7 35·7	7 13·8	1·8	0·9	7·8	4·0	13·8	7·0
19	7 34·8	7 36·0	7 14·0	1·9	1·0	7·9	4·0	13·9	7·1
20	7 35·0	7 36·2	7 14·3	2·0	1·0	8·0	4·1	14·0	7·1
21	7 35·3	7 36·5	7 14·5	2·1	1·1	8·1	4·1	14·1	7·2
22	7 35·5	7 36·7	7 14·7	2·2	1·1	8·2	4·2	14·2	7·2
23	7 35·8	7 37·0	7 15·0	2·3	1·2	8·3	4·2	14·3	7·3
24	7 36·0	7 37·2	7 15·2	2·4	1·2	8·4	4·3	14·4	7·3
25	7 36·3	7 37·5	7 15·5	2·5	1·3	8·5	4·3	14·5	7·4
26	7 36·5	7 37·7	7 15·7	2·6	1·3	8·6	4·4	14·6	7·4
27	7 36·8	7 38·0	7 15·9	2·7	1·4	8·7	4·4	14·7	7·5
28	7 37·0	7 38·3	7 16·2	2·8	1·4	8·8	4·5	14·8	7·5
29	7 37·3	7 38·5	7 16·4	2·9	1·5	8·9	4·5	14·9	7·6
30	7 37·5	7 38·8	7 16·7	3·0	1·5	9·0	4·6	15·0	7·6
31	7 37·8	7 39·0	7 16·9	3·1	1·6	9·1	4·6	15·1	7·7
32	7 38·0	7 39·3	7 17·1	3·2	1·6	9·2	4·7	15·2	7·7
33	7 38·3	7 39·5	7 17·4	3·3	1·7	9·3	4·7	15·3	7·8
34	7 38·5	7 39·8	7 17·6	3·4	1·7	9·4	4·8	15·4	7·8
35	7 38·8	7 40·0	7 17·9	3·5	1·8	9·5	4·8	15·5	7·9
36	7 39·0	7 40·3	7 18·1	3·6	1·8	9·6	4·9	15·6	7·9
37	7 39·3	7 40·5	7 18·3	3·7	1·9	9·7	4·9	15·7	8·0
38	7 39·5	7 40·8	7 18·6	3·8	1·9	9·8	5·0	15·8	8·0
39	7 39·8	7 41·0	7 18·8	3·9	2·0	9·9	5·0	15·9	8·1
40	7 40·0	7 41·3	7 19·0	4·0	2·0	10·0	5·1	16·0	8·1
41	7 40·3	7 41·5	7 19·3	4·1	2·1	10·1	5·1	16·1	8·2
42	7 40·5	7 41·8	7 19·5	4·2	2·1	10·2	5·2	16·2	8·2
43	7 40·8	7 42·0	7 19·8	4·3	2·2	10·3	5·2	16·3	8·3
44	7 41·0	7 42·3	7 20·0	4·4	2·2	10·4	5·3	16·4	8·3
45	7 41·3	7 42·5	7 20·2	4·5	2·3	10·5	5·3	16·5	8·4
46	7 41·5	7 42·8	7 20·5	4·6	2·3	10·6	5·4	16·6	8·4
47	7 41·8	7 43·0	7 20·7	4·7	2·4	10·7	5·4	16·7	8·5
48	7 42·0	7 43·3	7 21·0	4·8	2·4	10·8	5·5	16·8	8·5
49	7 42·3	7 43·5	7 21·2	4·9	2·5	10·9	5·5	16·9	8·6
50	7 42·5	7 43·8	7 21·4	5·0	2·5	11·0	5·6	17·0	8·6
51	7 42·8	7 44·0	7 21·7	5·1	2·6	11·1	5·6	17·1	8·7
52	7 43·0	7 44·3	7 21·9	5·2	2·6	11·2	5·7	17·2	8·7
53	7 43·3	7 44·5	7 22·1	5·3	2·7	11·3	5·7	17·3	8·8
54	7 43·5	7 44·8	7 22·4	5·4	2·7	11·4	5·8	17·4	8·8
55	7 43·8	7 45·0	7 22·6	5·5	2·8	11·5	5·8	17·5	8·9
56	7 44·0	7 45·3	7 22·9	5·6	2·8	11·6	5·9	17·6	8·9
57	7 44·3	7 45·5	7 23·1	5·7	2·9	11·7	5·9	17·7	9·0
58	7 44·5	7 45·8	7 23·3	5·8	2·9	11·8	6·0	17·8	9·0
59	7 44·8	7 46·0	7 23·6	5·9	3·0	11·9	6·0	17·9	9·1
60	7 45·0	7 46·3	7 23·8	6·0	3·1	12·0	6·1	18·0	9·2

31m	SUN PLANETS	ARIES	MOON	v or d	Corrn	v or d	Corrn	v or d	Corrn
s	° ′	° ′	° ′	′	′	′	′	′	′
00	7 45·0	7 46·3	7 23·8	0·0	0·0	6·0	3·2	12·0	6·3
01	7 45·3	7 46·5	7 24·1	0·1	0·1	6·1	3·2	12·1	6·4
02	7 45·5	7 46·8	7 24·3	0·2	0·1	6·2	3·3	12·2	6·4
03	7 45·8	7 47·0	7 24·5	0·3	0·2	6·3	3·3	12·3	6·5
04	7 46·0	7 47·3	7 24·8	0·4	0·2	6·4	3·4	12·4	6·5
05	7 46·3	7 47·5	7 25·0	0·5	0·3	6·5	3·4	12·5	6·6
06	7 46·5	7 47·8	7 25·2	0·6	0·3	6·6	3·5	12·6	6·6
07	7 46·8	7 48·0	7 25·5	0·7	0·4	6·7	3·5	12·7	6·7
08	7 47·0	7 48·3	7 25·7	0·8	0·4	6·8	3·6	12·8	6·7
09	7 47·3	7 48·5	7 26·0	0·9	0·5	6·9	3·6	12·9	6·8
10	7 47·5	7 48·8	7 26·2	1·0	0·5	7·0	3·7	13·0	6·8
11	7 47·8	7 49·0	7 26·4	1·1	0·6	7·1	3·7	13·1	6·9
12	7 48·0	7 49·3	7 26·7	1·2	0·6	7·2	3·8	13·2	6·9
13	7 48·3	7 49·5	7 26·9	1·3	0·7	7·3	3·8	13·3	7·0
14	7 48·5	7 49·8	7 27·2	1·4	0·7	7·4	3·9	13·4	7·0
15	7 48·8	7 50·0	7 27·4	1·5	0·8	7·5	3·9	13·5	7·1
16	7 49·0	7 50·3	7 27·6	1·6	0·8	7·6	4·0	13·6	7·1
17	7 49·3	7 50·5	7 27·9	1·7	0·9	7·7	4·0	13·7	7·2
18	7 49·5	7 50·8	7 28·1	1·8	0·9	7·8	4·1	13·8	7·2
19	7 49·8	7 51·0	7 28·4	1·9	1·0	7·9	4·1	13·9	7·3
20	7 50·0	7 51·3	7 28·6	2·0	1·1	8·0	4·2	14·0	7·4
21	7 50·3	7 51·5	7 28·8	2·1	1·1	8·1	4·3	14·1	7·4
22	7 50·5	7 51·8	7 29·1	2·2	1·2	8·2	4·3	14·2	7·5
23	7 50·8	7 52·0	7 29·3	2·3	1·2	8·3	4·4	14·3	7·5
24	7 51·0	7 52·3	7 29·5	2·4	1·3	8·4	4·4	14·4	7·6
25	7 51·3	7 52·5	7 29·8	2·5	1·3	8·5	4·5	14·5	7·6
26	7 51·5	7 52·8	7 30·0	2·6	1·4	8·6	4·5	14·6	7·7
27	7 51·8	7 53·0	7 30·3	2·7	1·4	8·7	4·6	14·7	7·7
28	7 52·0	7 53·3	7 30·5	2·8	1·5	8·8	4·6	14·8	7·8
29	7 52·3	7 53·5	7 30·7	2·9	1·5	8·9	4·7	14·9	7·8
30	7 52·5	7 53·8	7 31·0	3·0	1·6	9·0	4·7	15·0	7·9
31	7 52·8	7 54·0	7 31·2	3·1	1·6	9·1	4·8	15·1	7·9
32	7 53·0	7 54·3	7 31·5	3·2	1·7	9·2	4·8	15·2	8·0
33	7 53·3	7 54·5	7 31·7	3·3	1·7	9·3	4·9	15·3	8·0
34	7 53·5	7 54·8	7 31·9	3·4	1·8	9·4	4·9	15·4	8·1
35	7 53·8	7 55·0	7 32·2	3·5	1·8	9·5	5·0	15·5	8·1
36	7 54·0	7 55·3	7 32·4	3·6	1·9	9·6	5·0	15·6	8·2
37	7 54·3	7 55·5	7 32·6	3·7	1·9	9·7	5·1	15·7	8·2
38	7 54·5	7 55·8	7 32·9	3·8	2·0	9·8	5·1	15·8	8·3
39	7 54·8	7 56·0	7 33·1	3·9	2·0	9·9	5·2	15·9	8·3
40	7 55·0	7 56·3	7 33·4	4·0	2·1	10·0	5·3	16·0	8·4
41	7 55·3	7 56·6	7 33·6	4·1	2·2	10·1	5·3	16·1	8·5
42	7 55·5	7 56·8	7 33·8	4·2	2·2	10·2	5·4	16·2	8·5
43	7 55·8	7 57·1	7 34·1	4·3	2·3	10·3	5·4	16·3	8·6
44	7 56·0	7 57·3	7 34·3	4·4	2·3	10·4	5·5	16·4	8·6
45	7 56·3	7 57·6	7 34·6	4·5	2·4	10·5	5·5	16·5	8·7
46	7 56·5	7 57·8	7 34·8	4·6	2·4	10·6	5·6	16·6	8·7
47	7 56·8	7 58·1	7 35·0	4·7	2·5	10·7	5·6	16·7	8·8
48	7 57·0	7 58·3	7 35·3	4·8	2·5	10·8	5·7	16·8	8·8
49	7 57·3	7 58·6	7 35·5	4·9	2·6	10·9	5·7	16·9	8·9
50	7 57·5	7 58·8	7 35·7	5·0	2·6	11·0	5·8	17·0	8·9
51	7 57·8	7 59·1	7 36·0	5·1	2·7	11·1	5·8	17·1	9·0
52	7 58·0	7 59·3	7 36·2	5·2	2·7	11·2	5·9	17·2	9·0
53	7 58·3	7 59·6	7 36·5	5·3	2·8	11·3	5·9	17·3	9·1
54	7 58·5	7 59·8	7 36·7	5·4	2·8	11·4	6·0	17·4	9·1
55	7 58·8	8 00·1	7 36·9	5·5	2·9	11·5	6·0	17·5	9·2
56	7 59·0	8 00·3	7 37·2	5·6	2·9	11·6	6·1	17·6	9·2
57	7 59·3	8 00·6	7 37·4	5·7	3·0	11·7	6·1	17·7	9·3
58	7 59·5	8 00·8	7 37·7	5·8	3·0	11·8	6·2	17·8	9·3
59	7 59·8	8 01·1	7 37·9	5·9	3·1	11·9	6·2	17·9	9·4
60	8 00·0	8 01·3	7 38·1	6·0	3·2	12·0	6·3	18·0	9·5

32^{m}	SUN PLANETS	ARIES	MOON	*v* or *d*	Corrⁿ	*v* or *d*	Corrⁿ	*v* or *d*	Corrⁿ
s	° ′	° ′	° ′	′	′	′	′	′	′
00	8 00·0	8 01·3	7 38·1	0·0	0·0	6·0	3·3	12·0	6·5
01	8 00·3	8 01·6	7 38·4	0·1	0·1	6·1	3·3	12·1	6·6
02	8 00·5	8 01·8	7 38·6	0·2	0·1	6·2	3·4	12·2	6·6
03	8 00·8	8 02·1	7 38·8	0·3	0·2	6·3	3·4	12·3	6·7
04	8 01·0	8 02·3	7 39·1	0·4	0·2	6·4	3·5	12·4	6·7
05	8 01·3	8 02·6	7 39·3	0·5	0·3	6·5	3·5	12·5	6·8
06	8 01·5	8 02·8	7 39·6	0·6	0·3	6·6	3·6	12·6	6·8
07	8 01·8	8 03·1	7 39·8	0·7	0·4	6·7	3·6	12·7	6·9
08	8 02·0	8 03·3	7 40·0	0·8	0·4	6·8	3·7	12·8	6·9
09	8 02·3	8 03·6	7 40·3	0·9	0·5	6·9	3·7	12·9	7·0
10	8 02·5	8 03·8	7 40·5	1·0	0·5	7·0	3·8	13·0	7·0
11	8 02·8	8 04·1	7 40·8	1·1	0·6	7·1	3·8	13·1	7·1
12	8 03·0	8 04·3	7 41·0	1·2	0·7	7·2	3·9	13·2	7·2
13	8 03·3	8 04·6	7 41·2	1·3	0·7	7·3	4·0	13·3	7·2
14	8 03·5	8 04·8	7 41·5	1·4	0·8	7·4	4·0	13·4	7·3
15	8 03·8	8 05·1	7 41·7	1·5	0·8	7·5	4·1	13·5	7·3
16	8 04·0	8 05·3	7 42·0	1·6	0·9	7·6	4·1	13·6	7·4
17	8 04·3	8 05·6	7 42·2	1·7	0·9	7·7	4·2	13·7	7·4
18	8 04·5	8 05·8	7 42·4	1·8	1·0	7·8	4·2	13·8	7·5
19	8 04·8	8 06·1	7 42·7	1·9	1·0	7·9	4·3	13·9	7·5
20	8 05·0	8 06·3	7 42·9	2·0	1·1	8·0	4·3	14·0	7·6
21	8 05·3	8 06·6	7 43·1	2·1	1·1	8·1	4·4	14·1	7·6
22	8 05·5	8 06·8	7 43·4	2·2	1·2	8·2	4·4	14·2	7·7
23	8 05·8	8 07·1	7 43·6	2·3	1·2	8·3	4·5	14·3	7·7
24	8 06·0	8 07·3	7 43·9	2·4	1·3	8·4	4·6	14·4	7·8
25	8 06·3	8 07·6	7 44·1	2·5	1·4	8·5	4·6	14·5	7·9
26	8 06·5	8 07·8	7 44·3	2·6	1·4	8·6	4·7	14·6	7·9
27	8 06·8	8 08·1	7 44·6	2·7	1·5	8·7	4·7	14·7	8·0
28	8 07·0	8 08·3	7 44·8	2·8	1·5	8·8	4·8	14·8	8·0
29	8 07·3	8 08·6	7 45·1	2·9	1·6	8·9	4·8	14·9	8·1
30	8 07·5	8 08·8	7 45·3	3·0	1·6	9·0	4·9	15·0	8·1
31	8 07·8	8 09·1	7 45·5	3·1	1·7	9·1	4·9	15·1	8·2
32	8 08·0	8 09·3	7 45·8	3·2	1·7	9·2	5·0	15·2	8·2
33	8 08·3	8 09·6	7 46·0	3·3	1·8	9·3	5·0	15·3	8·3
34	8 08·5	8 09·8	7 46·2	3·4	1·8	9·4	5·1	15·4	8·3
35	8 08·8	8 10·1	7 46·5	3·5	1·9	9·5	5·1	15·5	8·4
36	8 09·0	8 10·3	7 46·7	3·6	2·0	9·6	5·2	15·6	8·5
37	8 09·3	8 10·6	7 47·0	3·7	2·0	9·7	5·3	15·7	8·5
38	8 09·5	8 10·8	7 47·2	3·8	2·1	9·8	5·3	15·8	8·6
39	8 09·8	8 11·1	7 47·4	3·9	2·1	9·9	5·4	15·9	8·6
40	8 10·0	8 11·3	7 47·7	4·0	2·2	10·0	5·4	16·0	8·7
41	8 10·3	8 11·6	7 47·9	4·1	2·2	10·1	5·5	16·1	8·7
42	8 10·5	8 11·8	7 48·2	4·2	2·3	10·2	5·5	16·2	8·8
43	8 10·8	8 12·1	7 48·4	4·3	2·3	10·3	5·6	16·3	8·8
44	8 11·0	8 12·3	7 48·6	4·4	2·4	10·4	5·6	16·4	8·9
45	8 11·3	8 12·6	7 48·9	4·5	2·4	10·5	5·7	16·5	8·9
46	8 11·5	8 12·8	7 49·1	4·6	2·5	10·6	5·7	16·6	9·0
47	8 11·8	8 13·1	7 49·3	4·7	2·5	10·7	5·8	16·7	9·0
48	8 12·0	8 13·3	7 49·6	4·8	2·6	10·8	5·9	16·8	9·1
49	8 12·3	8 13·6	7 49·8	4·9	2·7	10·9	5·9	16·9	9·2
50	8 12·5	8 13·8	7 50·1	5·0	2·7	11·0	6·0	17·0	9·2
51	8 12·8	8 14·1	7 50·3	5·1	2·8	11·1	6·0	17·1	9·3
52	8 13·0	8 14·3	7 50·5	5·2	2·8	11·2	6·1	17·2	9·3
53	8 13·3	8 14·6	7 50·8	5·3	2·9	11·3	6·1	17·3	9·4
54	8 13·5	8 14·9	7 51·0	5·4	2·9	11·4	6·2	17·4	9·4
55	8 13·8	8 15·1	7 51·3	5·5	3·0	11·5	6·2	17·5	9·5
56	8 14·0	8 15·4	7 51·5	5·6	3·0	11·6	6·3	17·6	9·5
57	8 14·3	8 15·6	7 51·7	5·7	3·1	11·7	6·3	17·7	9·6
58	8 14·5	8 15·9	7 52·0	5·8	3·1	11·8	6·4	17·8	9·6
59	8 14·8	8 16·1	7 52·2	5·9	3·2	11·9	6·4	17·9	9·7
60	8 15·0	8 16·4	7 52·5	6·0	3·3	12·0	6·5	18·0	9·8

33^{m}	SUN PLANETS	ARIES	MOON	*v* or *d*	Corrⁿ	*v* or *d*	Corrⁿ	*v* or *d*	Corrⁿ
s	° ′	° ′	° ′	′	′	′	′	′	′
00	8 15·0	8 16·4	7 52·5	0·0	0·0	6·0	3·4	12·0	6·7
01	8 15·3	8 16·6	7 52·7	0·1	0·1	6·1	3·4	12·1	6·8
02	8 15·5	8 16·9	7 52·9	0·2	0·1	6·2	3·5	12·2	6·8
03	8 15·8	8 17·1	7 53·2	0·3	0·2	6·3	3·5	12·3	6·9
04	8 16·0	8 17·4	7 53·4	0·4	0·2	6·4	3·6	12·4	6·9
05	8 16·3	8 17·6	7 53·6	0·5	0·3	6·5	3·6	12·5	7·0
06	8 16·5	8 17·9	7 53·9	0·6	0·3	6·6	3·7	12·6	7·0
07	8 16·8	8 18·1	7 54·1	0·7	0·4	6·7	3·7	12·7	7·1
08	8 17·0	8 18·4	7 54·4	0·8	0·4	6·8	3·8	12·8	7·1
09	8 17·3	8 18·6	7 54·6	0·9	0·5	6·9	3·9	12·9	7·2
10	8 17·5	8 18·9	7 54·8	1·0	0·6	7·0	3·9	13·0	7·3
11	8 17·8	8 19·1	7 55·1	1·1	0·6	7·1	4·0	13·1	7·3
12	8 18·0	8 19·4	7 55·3	1·2	0·7	7·2	4·0	13·2	7·4
13	8 18·3	8 19·6	7 55·6	1·3	0·7	7·3	4·1	13·3	7·4
14	8 18·5	8 19·9	7 55·8	1·4	0·8	7·4	4·1	13·4	7·5
15	8 18·8	8 20·1	7 56·0	1·5	0·8	7·5	4·2	13·5	7·5
16	8 19·0	8 20·4	7 56·3	1·6	0·9	7·6	4·2	13·6	7·6
17	8 19·3	8 20·6	7 56·5	1·7	0·9	7·7	4·3	13·7	7·6
18	8 19·5	8 20·9	7 56·7	1·8	1·0	7·8	4·4	13·8	7·7
19	8 19·8	8 21·1	7 57·0	1·9	1·1	7·9	4·4	13·9	7·8
20	8 20·0	8 21·4	7 57·2	2·0	1·1	8·0	4·5	14·0	7·8
21	8 20·3	8 21·6	7 57·5	2·1	1·2	8·1	4·5	14·1	7·9
22	8 20·5	8 21·9	7 57·7	2·2	1·2	8·2	4·6	14·2	7·9
23	8 20·8	8 22·1	7 57·9	2·3	1·3	8·3	4·6	14·3	8·0
24	8 21·0	8 22·4	7 58·2	2·4	1·3	8·4	4·7	14·4	8·0
25	8 21·3	8 22·6	7 58·4	2·5	1·4	8·5	4·7	14·5	8·1
26	8 21·5	8 22·9	7 58·7	2·6	1·5	8·6	4·8	14·6	8·2
27	8 21·8	8 23·1	7 58·9	2·7	1·5	8·7	4·9	14·7	8·2
28	8 22·0	8 23·4	7 59·1	2·8	1·6	8·8	4·9	14·8	8·3
29	8 22·3	8 23·6	7 59·4	2·9	1·6	8·9	5·0	14·9	8·3
30	8 22·5	8 23·9	7 59·6	3·0	1·7	9·0	5·0	15·0	8·4
31	8 22·8	8 24·1	7 59·8	3·1	1·7	9·1	5·1	15·1	8·4
32	8 23·0	8 24·4	8 00·1	3·2	1·8	9·2	5·1	15·2	8·5
33	8 23·3	8 24·6	8 00·3	3·3	1·8	9·3	5·2	15·3	8·5
34	8 23·5	8 24·9	8 00·6	3·4	1·9	9·4	5·2	15·4	8·6
35	8 23·8	8 25·1	8 00·8	3·5	2·0	9·5	5·3	15·5	8·7
36	8 24·0	8 25·4	8 01·0	3·6	2·0	9·6	5·4	15·6	8·7
37	8 24·3	8 25·6	8 01·3	3·7	2·1	9·7	5·4	15·7	8·8
38	8 24·5	8 25·9	8 01·5	3·8	2·1	9·8	5·5	15·8	8·8
39	8 24·8	8 26·1	8 01·8	3·9	2·2	9·9	5·5	15·9	8·9
40	8 25·0	8 26·4	8 02·0	4·0	2·2	10·0	5·6	16·0	8·9
41	8 25·3	8 26·6	8 02·2	4·1	2·3	10·1	5·6	16·1	9·0
42	8 25·5	8 26·9	8 02·5	4·2	2·3	10·2	5·7	16·2	9·0
43	8 25·8	8 27·1	8 02·7	4·3	2·4	10·3	5·8	16·3	9·1
44	8 26·0	8 27·4	8 02·9	4·4	2·5	10·4	5·8	16·4	9·2
45	8 26·3	8 27·6	8 03·2	4·5	2·5	10·5	5·9	16·5	9·2
46	8 26·5	8 27·9	8 03·4	4·6	2·6	10·6	5·9	16·6	9·3
47	8 26·8	8 28·1	8 03·7	4·7	2·6	10·7	6·0	16·7	9·3
48	8 27·0	8 28·4	8 03·9	4·8	2·7	10·8	6·0	16·8	9·4
49	8 27·3	8 28·6	8 04·1	4·9	2·7	10·9	6·1	16·9	9·4
50	8 27·5	8 28·9	8 04·4	5·0	2·8	11·0	6·1	17·0	9·5
51	8 27·8	8 29·1	8 04·6	5·1	2·8	11·1	6·2	17·1	9·5
52	8 28·0	8 29·4	8 04·9	5·2	2·9	11·2	6·3	17·2	9·6
53	8 28·3	8 29·6	8 05·1	5·3	3·0	11·3	6·3	17·3	9·7
54	8 28·5	8 29·9	8 05·3	5·4	3·0	11·4	6·4	17·4	9·7
55	8 28·8	8 30·1	8 05·6	5·5	3·1	11·5	6·4	17·5	9·8
56	8 29·0	8 30·4	8 05·8	5·6	3·1	11·6	6·5	17·6	9·8
57	8 29·3	8 30·6	8 06·1	5·7	3·2	11·7	6·5	17·7	9·9
58	8 29·5	8 30·9	8 06·3	5·8	3·2	11·8	6·6	17·8	9·9
59	8 29·8	8 31·1	8 06·5	5·9	3·3	11·9	6·6	17·9	10·0
60	8 30·0	8 31·4	8 06·8	6·0	3·4	12·0	6·7	18·0	10·1

34^{m}	SUN PLANETS	ARIES	MOON	v or d	Corr^{n}	v or d	Corr^{n}	v or d	Corr^{n}
s	° ′	° ′	° ′	′	′	′	′	′	′
00	8 30·0	8 31·4	8 06·8	0·0	0·0	6·0	3·5	12·0	6·9
01	8 30·3	8 31·6	8 07·0	0·1	0·1	6·1	3·5	12·1	7·0
02	8 30·5	8 31·9	8 07·2	0·2	0·1	6·2	3·6	12·2	7·0
03	8 30·8	8 32·1	8 07·5	0·3	0·2	6·3	3·6	12·3	7·1
04	8 31·0	8 32·4	8 07·7	0·4	0·2	6·4	3·7	12·4	7·1
05	8 31·3	8 32·6	8 08·0	0·5	0·3	6·5	3·7	12·5	7·2
06	8 31·5	8 32·9	8 08·2	0·6	0·3	6·6	3·8	12·6	7·2
07	8 31·8	8 33·2	8 08·4	0·7	0·4	6·7	3·9	12·7	7·3
08	8 32·0	8 33·4	8 08·7	0·8	0·5	6·8	3·9	12·8	7·4
09	8 32·3	8 33·7	8 08·9	0·9	0·5	6·9	4·0	12·9	7·4
10	8 32·5	8 33·9	8 09·2	1·0	0·6	7·0	4·0	13·0	7·5
11	8 32·8	8 34·2	8 09·4	1·1	0·6	7·1	4·1	13·1	7·5
12	8 33·0	8 34·4	8 09·6	1·2	0·7	7·2	4·1	13·2	7·6
13	8 33·3	8 34·7	8 09·9	1·3	0·7	7·3	4·2	13·3	7·6
14	8 33·5	8 34·9	8 10·1	1·4	0·8	7·4	4·3	13·4	7·7
15	8 33·8	8 35·2	8 10·3	1·5	0·9	7·5	4·3	13·5	7·8
16	8 34·0	8 35·4	8 10·6	1·6	0·9	7·6	4·4	13·6	7·8
17	8 34·3	8 35·7	8 10·8	1·7	1·0	7·7	4·4	13·7	7·9
18	8 34·5	8 35·9	8 11·1	1·8	1·0	7·8	4·5	13·8	7·9
19	8 34·8	8 36·2	8 11·3	1·9	1·1	7·9	4·5	13·9	8·0
20	8 35·0	8 36·4	8 11·5	2·0	1·2	8·0	4·6	14·0	8·1
21	8 35·3	8 36·7	8 11·8	2·1	1·2	8·1	4·7	14·1	8·1
22	8 35·5	8 36·9	8 12·0	2·2	1·3	8·2	4·7	14·2	8·2
23	8 35·8	8 37·2	8 12·3	2·3	1·3	8·3	4·8	14·3	8·2
24	8 36·0	8 37·4	8 12·5	2·4	1·4	8·4	4·8	14·4	8·3
25	8 36·3	8 37·7	8 12·7	2·5	1·4	8·5	4·9	14·5	8·3
26	8 36·5	8 37·9	8 13·0	2·6	1·5	8·6	4·9	14·6	8·4
27	8 36·8	8 38·2	8 13·2	2·7	1·6	8·7	5·0	14·7	8·5
28	8 37·0	8 38·4	8 13·4	2·8	1·6	8·8	5·1	14·8	8·5
29	8 37·3	8 38·7	8 13·7	2·9	1·7	8·9	5·1	14·9	8·6
30	8 37·5	8 38·9	8 13·9	3·0	1·7	9·0	5·2	15·0	8·6
31	8 37·8	8 39·2	8 14·2	3·1	1·8	9·1	5·2	15·1	8·7
32	8 38·0	8 39·4	8 14·4	3·2	1·8	9·2	5·3	15·2	8·7
33	8 38·3	8 39·7	8 14·6	3·3	1·9	9·3	5·3	15·3	8·8
34	8 38·5	8 39·9	8 14·9	3·4	2·0	9·4	5·4	15·4	8·9
35	8 38·8	8 40·2	8 15·1	3·5	2·0	9·5	5·5	15·5	8·9
36	8 39·0	8 40·4	8 15·4	3·6	2·1	9·6	5·5	15·6	9·0
37	8 39·3	8 40·7	8 15·6	3·7	2·1	9·7	5·6	15·7	9·0
38	8 39·5	8 40·9	8 15·8	3·8	2·2	9·8	5·6	15·8	9·1
39	8 39·8	8 41·2	8 16·1	3·9	2·2	9·9	5·7	15·9	9·1
40	8 40·0	8 41·4	8 16·3	4·0	2·3	10·0	5·8	16·0	9·2
41	8 40·3	8 41·7	8 16·5	4·1	2·4	10·1	5·8	16·1	9·3
42	8 40·5	8 41·9	8 16·8	4·2	2·4	10·2	5·9	16·2	9·3
43	8 40·8	8 42·2	8 17·0	4·3	2·5	10·3	5·9	16·3	9·4
44	8 41·0	8 42·4	8 17·3	4·4	2·5	10·4	6·0	16·4	9·4
45	8 41·3	8 42·7	8 17·5	4·5	2·6	10·5	6·0	16·5	9·5
46	8 41·5	8 42·9	8 17·7	4·6	2·6	10·6	6·1	16·6	9·5
47	8 41·8	8 43·2	8 18·0	4·7	2·7	10·7	6·2	16·7	9·6
48	8 42·0	8 43·4	8 18·2	4·8	2·8	10·8	6·2	16·8	9·7
49	8 42·3	8 43·7	8 18·5	4·9	2·8	10·9	6·3	16·9	9·7
50	8 42·5	8 43·9	8 18·7	5·0	2·9	11·0	6·3	17·0	9·8
51	8 42·8	8 44·2	8 18·9	5·1	2·9	11·1	6·4	17·1	9·8
52	8 43·0	8 44·4	8 19·2	5·2	3·0	11·2	6·4	17·2	9·9
53	8 43·3	8 44·7	8 19·4	5·3	3·0	11·3	6·5	17·3	9·9
54	8 43·5	8 44·9	8 19·7	5·4	3·1	11·4	6·6	17·4	10·0
55	8 43·8	8 45·2	8 19·9	5·5	3·2	11·5	6·6	17·5	10·1
56	8 44·0	8 45·4	8 20·1	5·6	3·2	11·6	6·7	17·6	10·1
57	8 44·3	8 45·7	8 20·4	5·7	3·3	11·7	6·7	17·7	10·2
58	8 44·5	8 45·9	8 20·6	5·8	3·3	11·8	6·8	17·8	10·2
59	8 44·8	8 46·2	8 20·8	5·9	3·4	11·9	6·8	17·9	10·3
60	8 45·0	8 46·4	8 21·1	6·0	3·5	12·0	6·9	18·0	10·4

35^{m}	SUN PLANETS	ARIES	MOON	v or d	Corr^{n}	v or d	Corr^{n}	v or d	Corr^{n}
s	° ′	° ′	° ′	′	′	′	′	′	′
00	8 45·0	8 46·4	8 21·1	0·0	0·0	6·0	3·6	12·0	7·1
01	8 45·3	8 46·7	8 21·3	0·1	0·1	6·1	3·6	12·1	7·2
02	8 45·5	8 46·9	8 21·6	0·2	0·1	6·2	3·7	12·2	7·2
03	8 45·8	8 47·2	8 21·8	0·3	0·2	6·3	3·7	12·3	7·3
04	8 46·0	8 47·4	8 22·0	0·4	0·2	6·4	3·8	12·4	7·3
05	8 46·3	8 47·7	8 22·3	0·5	0·3	6·5	3·8	12·5	7·4
06	8 46·5	8 47·9	8 22·5	0·6	0·4	6·6	3·9	12·6	7·5
07	8 46·8	8 48·2	8 22·8	0·7	0·4	6·7	4·0	12·7	7·5
08	8 47·0	8 48·4	8 23·0	0·8	0·5	6·8	4·0	12·8	7·6
09	8 47·3	8 48·7	8 23·2	0·9	0·5	6·9	4·1	12·9	7·6
10	8 47·5	8 48·9	8 23·5	1·0	0·6	7·0	4·1	13·0	7·7
11	8 47·8	8 49·2	8 23·7	1·1	0·7	7·1	4·2	13·1	7·8
12	8 48·0	8 49·4	8 23·9	1·2	0·7	7·2	4·3	13·2	7·8
13	8 48·3	8 49·7	8 24·2	1·3	0·8	7·3	4·3	13·3	7·9
14	8 48·5	8 49·9	8 24·4	1·4	0·8	7·4	4·4	13·4	7·9
15	8 48·8	8 50·2	8 24·7	1·5	0·9	7·5	4·4	13·5	8·0
16	8 49·0	8 50·4	8 24·9	1·6	0·9	7·6	4·5	13·6	8·0
17	8 49·3	8 50·7	8 25·1	1·7	1·0	7·7	4·6	13·7	8·1
18	8 49·5	8 50·9	8 25·4	1·8	1·1	7·8	4·6	13·8	8·2
19	8 49·8	8 51·2	8 25·6	1·9	1·1	7·9	4·7	13·9	8·2
20	8 50·0	8 51·5	8 25·9	2·0	1·2	8·0	4·7	14·0	8·3
21	8 50·3	8 51·7	8 26·1	2·1	1·2	8·1	4·8	14·1	8·3
22	8 50·5	8 52·0	8 26·3	2·2	1·3	8·2	4·9	14·2	8·4
23	8 50·8	8 52·2	8 26·6	2·3	1·4	8·3	4·9	14·3	8·5
24	8 51·0	8 52·5	8 26·8	2·4	1·4	8·4	5·0	14·4	8·5
25	8 51·3	8 52·7	8 27·0	2·5	1·5	8·5	5·0	14·5	8·6
26	8 51·5	8 53·0	8 27·3	2·6	1·5	8·6	5·1	14·6	8·6
27	8 51·8	8 53·2	8 27·5	2·7	1·6	8·7	5·1	14·7	8·7
28	8 52·0	8 53·5	8 27·8	2·8	1·7	8·8	5·2	14·8	8·8
29	8 52·3	8 53·7	8 28·0	2·9	1·7	8·9	5·3	14·9	8·8
30	8 52·5	8 54·0	8 28·2	3·0	1·8	9·0	5·3	15·0	8·9
31	8 52·8	8 54·2	8 28·5	3·1	1·8	9·1	5·4	15·1	8·9
32	8 53·0	8 54·5	8 28·7	3·2	1·9	9·2	5·4	15·2	9·0
33	8 53·3	8 54·7	8 29·0	3·3	2·0	9·3	5·5	15·3	9·1
34	8 53·5	8 55·0	8 29·2	3·4	2·0	9·4	5·6	15·4	9·1
35	8 53·8	8 55·2	8 29·4	3·5	2·1	9·5	5·6	15·5	9·2
36	8 54·0	8 55·5	8 29·7	3·6	2·1	9·6	5·7	15·6	9·2
37	8 54·3	8 55·7	8 29·9	3·7	2·2	9·7	5·7	15·7	9·3
38	8 54·5	8 56·0	8 30·2	3·8	2·2	9·8	5·8	15·8	9·3
39	8 54·8	8 56·2	8 30·4	3·9	2·3	9·9	5·9	15·9	9·4
40	8 55·0	8 56·5	8 30·6	4·0	2·4	10·0	5·9	16·0	9·5
41	8 55·3	8 56·7	8 30·9	4·1	2·4	10·1	6·0	16·1	9·5
42	8 55·5	8 57·0	8 31·1	4·2	2·5	10·2	6·0	16·2	9·6
43	8 55·8	8 57·2	8 31·3	4·3	2·5	10·3	6·1	16·3	9·6
44	8 56·0	8 57·5	8 31·6	4·4	2·6	10·4	6·2	16·4	9·7
45	8 56·3	8 57·7	8 31·8	4·5	2·7	10·5	6·2	16·5	9·8
46	8 56·5	8 58·0	8 32·1	4·6	2·7	10·6	6·3	16·6	9·8
47	8 56·8	8 58·2	8 32·3	4·7	2·8	10·7	6·3	16·7	9·9
48	8 57·0	8 58·5	8 32·5	4·8	2·8	10·8	6·4	16·8	9·9
49	8 57·3	8 58·7	8 32·8	4·9	2·9	10·9	6·4	16·9	10·0
50	8 57·5	8 59·0	8 33·0	5·0	3·0	11·0	6·5	17·0	10·1
51	8 57·8	8 59·2	8 33·3	5·1	3·0	11·1	6·6	17·1	10·1
52	8 58·0	8 59·5	8 33·5	5·2	3·1	11·2	6·6	17·2	10·2
53	8 58·3	8 59·7	8 33·7	5·3	3·1	11·3	6·7	17·3	10·2
54	8 58·5	9 00·0	8 34·0	5·4	3·2	11·4	6·7	17·4	10·3
55	8 58·8	9 00·2	8 34·2	5·5	3·3	11·5	6·8	17·5	10·4
56	8 59·0	9 00·5	8 34·4	5·6	3·3	11·6	6·9	17·6	10·4
57	8 59·3	9 00·7	8 34·7	5·7	3·4	11·7	6·9	17·7	10·5
58	8 59·5	9 01·0	8 34·9	5·8	3·4	11·8	7·0	17·8	10·5
59	8 59·8	9 01·2	8 35·2	5·9	3·5	11·9	7·0	17·9	10·6
60	9 00·0	9 01·5	8 35·4	6·0	3·6	12·0	7·1	18·0	10·7

36^{m}	SUN PLANETS	ARIES	MOON	v or d	Corr^{n}	v or d	Corr^{n}	v or d	Corr^{n}
s	° ′	° ′	° ′	′	′	′	′	′	′
00	9 00·0	9 01·5	8 35·4	0·0	0·0	6·0	3·7	12·0	7·3
01	9 00·3	9 01·7	8 35·6	0·1	0·1	6·1	3·7	12·1	7·4
02	9 00·5	9 02·0	8 35·9	0·2	0·1	6·2	3·8	12·2	7·4
03	9 00·8	9 02·2	8 36·1	0·3	0·2	6·3	3·8	12·3	7·5
04	9 01·0	9 02·5	8 36·4	0·4	0·2	6·4	3·9	12·4	7·5
05	9 01·3	9 02·7	8 36·6	0·5	0·3	6·5	4·0	12·5	7·6
06	9 01·5	9 03·0	8 36·8	0·6	0·4	6·6	4·0	12·6	7·7
07	9 01·8	9 03·2	8 37·1	0·7	0·4	6·7	4·1	12·7	7·7
08	9 02·0	9 03·5	8 37·3	0·8	0·5	6·8	4·1	12·8	7·8
09	9 02·3	9 03·7	8 37·5	0·9	0·5	6·9	4·2	12·9	7·8
10	9 02·5	9 04·0	8 37·8	1·0	0·6	7·0	4·3	13·0	7·9
11	9 02·8	9 04·2	8 38·0	1·1	0·7	7·1	4·3	13·1	8·0
12	9 03·0	9 04·5	8 38·3	1·2	0·7	7·2	4·4	13·2	8·0
13	9 03·3	9 04·7	8 38·5	1·3	0·8	7·3	4·4	13·3	8·1
14	9 03·5	9 05·0	8 38·7	1·4	0·9	7·4	4·5	13·4	8·2
15	9 03·8	9 05·2	8 39·0	1·5	0·9	7·5	4·6	13·5	8·2
16	9 04·0	9 05·5	8 39·2	1·6	1·0	7·6	4·6	13·6	8·3
17	9 04·3	9 05·7	8 39·5	1·7	1·0	7·7	4·7	13·7	8·3
18	9 04·5	9 06·0	8 39·7	1·8	1·1	7·8	4·7	13·8	8·4
19	9 04·8	9 06·2	8 39·9	1·9	1·2	7·9	4·8	13·9	8·5
20	9 05·0	9 06·5	8 40·2	2·0	1·2	8·0	4·9	14·0	8·5
21	9 05·3	9 06·7	8 40·4	2·1	1·3	8·1	4·9	14·1	8·6
22	9 05·5	9 07·0	8 40·6	2·2	1·3	8·2	5·0	14·2	8·6
23	9 05·8	9 07·2	8 40·9	2·3	1·4	8·3	5·0	14·3	8·7
24	9 06·0	9 07·5	8 41·1	2·4	1·5	8·4	5·1	14·4	8·8
25	9 06·3	9 07·7	8 41·4	2·5	1·5	8·5	5·2	14·5	8·8
26	9 06·5	9 08·0	8 41·6	2·6	1·6	8·6	5·2	14·6	8·9
27	9 06·8	9 08·2	8 41·8	2·7	1·6	8·7	5·3	14·7	8·9
28	9 07·0	9 08·5	8 42·1	2·8	1·7	8·8	5·4	14·8	9·0
29	9 07·3	9 08·7	8 42·3	2·9	1·8	8·9	5·4	14·9	9·1
30	9 07·5	9 09·0	8 42·6	3·0	1·8	9·0	5·5	15·0	9·1
31	9 07·8	9 09·2	8 42·8	3·1	1·9	9·1	5·5	15·1	9·2
32	9 08·0	9 09·5	8 43·0	3·2	1·9	9·2	5·6	15·2	9·2
33	9 08·3	9 09·8	8 43·3	3·3	2·0	9·3	5·7	15·3	9·3
34	9 08·5	9 10·0	8 43·5	3·4	2·1	9·4	5·7	15·4	9·4
35	9 08·8	9 10·3	8 43·8	3·5	2·1	9·5	5·8	15·5	9·4
36	9 09·0	9 10·5	8 44·0	3·6	2·2	9·6	5·8	15·6	9·5
37	9 09·3	9 10·8	8 44·2	3·7	2·3	9·7	5·9	15·7	9·6
38	9 09·5	9 11·0	8 44·5	3·8	2·3	9·8	6·0	15·8	9·6
39	9 09·8	9 11·3	8 44·7	3·9	2·4	9·9	6·0	15·9	9·7
40	9 10·0	9 11·5	8 44·9	4·0	2·4	10·0	6·1	16·0	9·7
41	9 10·3	9 11·8	8 45·2	4·1	2·5	10·1	6·1	16·1	9·8
42	9 10·5	9 12·0	8 45·4	4·2	2·6	10·2	6·2	16·2	9·9
43	9 10·8	9 12·3	8 45·7	4·3	2·6	10·3	6·3	16·3	9·9
44	9 11·0	9 12·5	8 45·9	4·4	2·7	10·4	6·3	16·4	10·0
45	9 11·3	9 12·8	8 46·1	4·5	2·7	10·5	6·4	16·5	10·0
46	9 11·5	9 13·0	8 46·4	4·6	2·8	10·6	6·4	16·6	10·1
47	9 11·8	9 13·3	8 46·6	4·7	2·9	10·7	6·5	16·7	10·2
48	9 12·0	9 13·5	8 46·9	4·8	2·9	10·8	6·6	16·8	10·2
49	9 12·3	9 13·8	8 47·1	4·9	3·0	10·9	6·6	16·9	10·3
50	9 12·5	9 14·0	8 47·3	5·0	3·0	11·0	6·7	17·0	10·3
51	9 12·8	9 14·3	8 47·6	5·1	3·1	11·1	6·8	17·1	10·4
52	9 13·0	9 14·5	8 47·8	5·2	3·2	11·2	6·8	17·2	10·5
53	9 13·3	9 14·8	8 48·0	5·3	3·2	11·3	6·9	17·3	10·5
54	9 13·5	9 15·0	8 48·3	5·4	3·3	11·4	6·9	17·4	10·6
55	9 13·8	9 15·3	8 48·5	5·5	3·3	11·5	7·0	17·5	10·6
56	9 14·0	9 15·5	8 48·8	5·6	3·4	11·6	7·1	17·6	10·7
57	9 14·3	9 15·8	8 49·0	5·7	3·5	11·7	7·1	17·7	10·8
58	9 14·5	9 16·0	8 49·2	5·8	3·5	11·8	7·2	17·8	10·8
59	9 14·8	9 16·3	8 49·5	5·9	3·6	11·9	7·2	17·9	10·9
60	9 15·0	9 16·5	8 49·7	6·0	3·7	12·0	7·3	18·0	11·0

37^{m}	SUN PLANETS	ARIES	MOON	v or d	Corr^{n}	v or d	Corr^{n}	v or d	Corr^{n}
s	° ′	° ′	° ′	′	′	′	′	′	′
00	9 15·0	9 16·5	8 49·7	0·0	0·0	6·0	3·8	12·0	7·5
01	9 15·3	9 16·8	8 50·0	0·1	0·1	6·1	3·8	12·1	7·6
02	9 15·5	9 17·0	8 50·2	0·2	0·1	6·2	3·9	12·2	7·6
03	9 15·8	9 17·3	8 50·4	0·3	0·2	6·3	3·9	12·3	7·7
04	9 16·0	9 17·5	8 50·7	0·4	0·3	6·4	4·0	12·4	7·8
05	9 16·3	9 17·8	8 50·9	0·5	0·3	6·5	4·1	12·5	7·8
06	9 16·5	9 18·0	8 51·1	0·6	0·4	6·6	4·1	12·6	7·9
07	9 16·8	9 18·3	8 51·4	0·7	0·4	6·7	4·2	12·7	7·9
08	9 17·0	9 18·5	8 51·6	0·8	0·5	6·8	4·3	12·8	8·0
09	9 17·3	9 18·8	8 51·9	0·9	0·6	6·9	4·3	12·9	8·1
10	9 17·5	9 19·0	8 52·1	1·0	0·6	7·0	4·4	13·0	8·1
11	9 17·8	9 19·3	8 52·3	1·1	0·7	7·1	4·4	13·1	8·2
12	9 18·0	9 19·5	8 52·6	1·2	0·8	7·2	4·5	13·2	8·3
13	9 18·3	9 19·8	8 52·8	1·3	0·8	7·3	4·6	13·3	8·3
14	9 18·5	9 20·0	8 53·1	1·4	0·9	7·4	4·6	13·4	8·4
15	9 18·8	9 20·3	8 53·3	1·5	0·9	7·5	4·7	13·5	8·4
16	9 19·0	9 20·5	8 53·5	1·6	1·0	7·6	4·8	13·6	8·5
17	9 19·3	9 20·8	8 53·8	1·7	1·1	7·7	4·8	13·7	8·6
18	9 19·5	9 21·0	8 54·0	1·8	1·1	7·8	4·9	13·8	8·6
19	9 19·8	9 21·3	8 54·3	1·9	1·2	7·9	4·9	13·9	8·7
20	9 20·0	9 21·5	8 54·5	2·0	1·3	8·0	5·0	14·0	8·8
21	9 20·3	9 21·8	8 54·7	2·1	1·3	8·1	5·1	14·1	8·8
22	9 20·5	9 22·0	8 55·0	2·2	1·4	8·2	5·1	14·2	8·9
23	9 20·8	9 22·3	8 55·2	2·3	1·4	8·3	5·2	14·3	8·9
24	9 21·0	9 22·5	8 55·4	2·4	1·5	8·4	5·3	14·4	9·0
25	9 21·3	9 22·8	8 55·7	2·5	1·6	8·5	5·3	14·5	9·1
26	9 21·5	9 23·0	8 55·9	2·6	1·6	8·6	5·4	14·6	9·1
27	9 21·8	9 23·3	8 56·2	2·7	1·7	8·7	5·4	14·7	9·2
28	9 22·0	9 23·5	8 56·4	2·8	1·8	8·8	5·5	14·8	9·3
29	9 22·3	9 23·8	8 56·6	2·9	1·8	8·9	5·6	14·9	9·3
30	9 22·5	9 24·0	8 56·9	3·0	1·9	9·0	5·6	15·0	9·4
31	9 22·8	9 24·3	8 57·1	3·1	1·9	9·1	5·7	15·1	9·4
32	9 23·0	9 24·5	8 57·4	3·2	2·0	9·2	5·8	15·2	9·5
33	9 23·3	9 24·8	8 57·6	3·3	2·1	9·3	5·8	15·3	9·6
34	9 23·5	9 25·0	8 57·8	3·4	2·1	9·4	5·9	15·4	9·6
35	9 23·8	9 25·3	8 58·1	3·5	2·2	9·5	5·9	15·5	9·7
36	9 24·0	9 25·5	8 58·3	3·6	2·3	9·6	6·0	15·6	9·8
37	9 24·3	9 25·8	8 58·5	3·7	2·3	9·7	6·1	15·7	9·8
38	9 24·5	9 26·0	8 58·8	3·8	2·4	9·8	6·1	15·8	9·9
39	9 24·8	9 26·3	8 59·0	3·9	2·4	9·9	6·2	15·9	9·9
40	9 25·0	9 26·5	8 59·3	4·0	2·5	10·0	6·3	16·0	10·0
41	9 25·3	9 26·8	8 59·5	4·1	2·6	10·1	6·3	16·1	10·1
42	9 25·5	9 27·0	8 59·7	4·2	2·6	10·2	6·4	16·2	10·1
43	9 25·8	9 27·3	9 00·0	4·3	2·7	10·3	6·4	16·3	10·2
44	9 26·0	9 27·5	9 00·2	4·4	2·8	10·4	6·5	16·4	10·3
45	9 26·3	9 27·8	9 00·5	4·5	2·8	10·5	6·6	16·5	10·3
46	9 26·5	9 28·1	9 00·7	4·6	2·9	10·6	6·6	16·6	10·4
47	9 26·8	9 28·3	9 00·9	4·7	2·9	10·7	6·7	16·7	10·4
48	9 27·0	9 28·6	9 01·2	4·8	3·0	10·8	6·8	16·8	10·5
49	9 27·3	9 28·8	9 01·4	4·9	3·1	10·9	6·8	16·9	10·6
50	9 27·5	9 29·1	9 01·6	5·0	3·1	11·0	6·9	17·0	10·6
51	9 27·8	9 29·3	9 01·9	5·1	3·2	11·1	6·9	17·1	10·7
52	9 28·0	9 29·6	9 02·1	5·2	3·3	11·2	7·0	17·2	10·8
53	9 28·3	9 29·8	9 02·4	5·3	3·3	11·3	7·1	17·3	10·8
54	9 28·5	9 30·1	9 02·6	5·4	3·4	11·4	7·1	17·4	10·9
55	9 28·8	9 30·3	9 02·8	5·5	3·4	11·5	7·2	17·5	10·9
56	9 29·0	9 30·6	9 03·1	5·6	3·5	11·6	7·3	17·6	11·0
57	9 29·3	9 30·8	9 03·3	5·7	3·6	11·7	7·3	17·7	11·1
58	9 29·5	9 31·1	9 03·6	5·8	3·6	11·8	7·4	17·8	11·1
59	9 29·8	9 31·3	9 03·8	5·9	3·7	11·9	7·4	17·9	11·2
60	9 30·0	9 31·6	9 04·0	6·0	3·8	12·0	7·5	18·0	11·3

^{m} 38	SUN PLANETS	ARIES	MOON	v or d	Corr^{n}	v or d	Corr^{n}	v or d	Corr^{n}
s	° ′	° ′	° ′	′	′	′	′	′	′
00	9 30·0	9 31·6	9 04·0	0·0	0·0	6·0	3·9	12·0	7·7
01	9 30·3	9 31·8	9 04·3	0·1	0·1	6·1	3·9	12·1	7·8
02	9 30·5	9 32·1	9 04·5	0·2	0·1	6·2	4·0	12·2	7·8
03	9 30·8	9 32·3	9 04·7	0·3	0·2	6·3	4·0	12·3	7·9
04	9 31·0	9 32·6	9 05·0	0·4	0·3	6·4	4·1	12·4	8·0
05	9 31·3	9 32·8	9 05·2	0·5	0·3	6·5	4·2	12·5	8·0
06	9 31·5	9 33·1	9 05·5	0·6	0·4	6·6	4·2	12·6	8·1
07	9 31·8	9 33·3	9 05·7	0·7	0·4	6·7	4·3	12·7	8·1
08	9 32·0	9 33·6	9 05·9	0·8	0·5	6·8	4·4	12·8	8·2
09	9 32·3	9 33·8	9 06·2	0·9	0·6	6·9	4·4	12·9	8·3
10	9 32·5	9 34·1	9 06·4	1·0	0·6	7·0	4·5	13·0	8·3
11	9 32·8	9 34·3	9 06·7	1·1	0·7	7·1	4·6	13·1	8·4
12	9 33·0	9 34·6	9 06·9	1·2	0·8	7·2	4·6	13·2	8·5
13	9 33·3	9 34·8	9 07·1	1·3	0·8	7·3	4·7	13·3	8·5
14	9 33·5	9 35·1	9 07·4	1·4	0·9	7·4	4·7	13·4	8·6
15	9 33·8	9 35·3	9 07·6	1·5	1·0	7·5	4·8	13·5	8·7
16	9 34·0	9 35·6	9 07·9	1·6	1·0	7·6	4·9	13·6	8·7
17	9 34·3	9 35·8	9 08·1	1·7	1·1	7·7	4·9	13·7	8·8
18	9 34·5	9 36·1	9 08·3	1·8	1·2	7·8	5·0	13·8	8·9
19	9 34·8	9 36·3	9 08·6	1·9	1·2	7·9	5·1	13·9	8·9
20	9 35·0	9 36·6	9 08·8	2·0	1·3	8·0	5·1	14·0	9·0
21	9 35·3	9 36·8	9 09·0	2·1	1·3	8·1	5·2	14·1	9·0
22	9 35·5	9 37·1	9 09·3	2·2	1·4	8·2	5·3	14·2	9·1
23	9 35·8	9 37·3	9 09·5	2·3	1·5	8·3	5·3	14·3	9·2
24	9 36·0	9 37·6	9 09·8	2·4	1·5	8·4	5·4	14·4	9·2
25	9 36·3	9 37·8	9 10·0	2·5	1·6	8·5	5·5	14·5	9·3
26	9 36·5	9 38·1	9 10·2	2·6	1·7	8·6	5·5	14·6	9·4
27	9 36·8	9 38·3	9 10·5	2·7	1·7	8·7	5·6	14·7	9·4
28	9 37·0	9 38·6	9 10·7	2·8	1·8	8·8	5·6	14·8	9·5
29	9 37·3	9 38·8	9 11·0	2·9	1·9	8·9	5·7	14·9	9·6
30	9 37·5	9 39·1	9 11·2	3·0	1·9	9·0	5·8	15·0	9·6
31	9 37·8	9 39·3	9 11·4	3·1	2·0	9·1	5·8	15·1	9·7
32	9 38·0	9 39·6	9 11·7	3·2	2·1	9·2	5·9	15·2	9·8
33	9 38·3	9 39·8	9 11·9	3·3	2·1	9·3	6·0	15·3	9·8
34	9 38·5	9 40·1	9 12·1	3·4	2·2	9·4	6·0	15·4	9·9
35	9 38·8	9 40·3	9 12·4	3·5	2·2	9·5	6·1	15·5	9·9
36	9 39·0	9 40·6	9 12·6	3·6	2·3	9·6	6·2	15·6	10·0
37	9 39·3	9 40·8	9 12·9	3·7	2·4	9·7	6·2	15·7	10·1
38	9 39·5	9 41·1	9 13·1	3·8	2·4	9·8	6·3	15·8	10·1
39	9 39·8	9 41·3	9 13·3	3·9	2·5	9·9	6·4	15·9	10·2
40	9 40·0	9 41·6	9 13·6	4·0	2·6	10·0	6·4	16·0	10·3
41	9 40·3	9 41·8	9 13·8	4·1	2·6	10·1	6·5	16·1	10·3
42	9 40·5	9 42·1	9 14·1	4·2	2·7	10·2	6·5	16·2	10·4
43	9 40·8	9 42·3	9 14·3	4·3	2·8	10·3	6·6	16·3	10·5
44	9 41·0	9 42·6	9 14·5	4·4	2·8	10·4	6·7	16·4	10·5
45	9 41·3	9 42·8	9 14·8	4·5	2·9	10·5	6·7	16·5	10·6
46	9 41·5	9 43·1	9 15·0	4·6	3·0	10·6	6·8	16·6	10·7
47	9 41·8	9 43·3	9 15·2	4·7	3·0	10·7	6·9	16·7	10·7
48	9 42·0	9 43·6	9 15·5	4·8	3·1	10·8	6·9	16·8	10·8
49	9 42·3	9 43·8	9 15·7	4·9	3·1	10·9	7·0	16·9	10·8
50	9 42·5	9 44·1	9 16·0	5·0	3·2	11·0	7·1	17·0	10·9
51	9 42·8	9 44·3	9 16·2	5·1	3·3	11·1	7·1	17·1	11·0
52	9 43·0	9 44·6	9 16·4	5·2	3·3	11·2	7·2	17·2	11·0
53	9 43·3	9 44·8	9 16·7	5·3	3·4	11·3	7·3	17·3	11·1
54	9 43·5	9 45·1	9 16·9	5·4	3·5	11·4	7·3	17·4	11·2
55	9 43·8	9 45·3	9 17·2	5·5	3·5	11·5	7·4	17·5	11·2
56	9 44·0	9 45·6	9 17·4	5·6	3·6	11·6	7·4	17·6	11·3
57	9 44·3	9 45·8	9 17·6	5·7	3·7	11·7	7·5	17·7	11·4
58	9 44·5	9 46·1	9 17·9	5·8	3·7	11·8	7·6	17·8	11·4
59	9 44·8	9 46·4	9 18·1	5·9	3·8	11·9	7·6	17·9	11·5
60	9 45·0	9 46·6	9 18·4	6·0	3·9	12·0	7·7	18·0	11·6

^{m} 39	SUN PLANETS	ARIES	MOON	v or d	Corr^{n}	v or d	Corr^{n}	v or d	Corr^{n}
s	° ′	° ′	° ′	′	′	′	′	′	′
00	9 45·0	9 46·6	9 18·4	0·0	0·0	6·0	4·0	12·0	7·9
01	9 45·3	9 46·9	9 18·6	0·1	0·1	6·1	4·0	12·1	8·0
02	9 45·5	9 47·1	9 18·8	0·2	0·1	6·2	4·1	12·2	8·0
03	9 45·8	9 47·4	9 19·1	0·3	0·2	6·3	4·1	12·3	8·1
04	9 46·0	9 47·6	9 19·3	0·4	0·3	6·4	4·2	12·4	8·2
05	9 46·3	9 47·9	9 19·5	0·5	0·3	6·5	4·3	12·5	8·2
06	9 46·5	9 48·1	9 19·8	0·6	0·4	6·6	4·3	12·6	8·3
07	9 46·8	9 48·4	9 20·0	0·7	0·5	6·7	4·4	12·7	8·4
08	9 47·0	9 48·6	9 20·3	0·8	0·5	6·8	4·5	12·8	8·4
09	9 47·3	9 48·9	9 20·5	0·9	0·6	6·9	4·5	12·9	8·5
10	9 47·5	9 49·1	9 20·7	1·0	0·7	7·0	4·6	13·0	8·6
11	9 47·8	9 49·4	9 21·0	1·1	0·7	7·1	4·7	13·1	8·6
12	9 48·0	9 49·6	9 21·2	1·2	0·8	7·2	4·7	13·2	8·7
13	9 48·3	9 49·9	9 21·5	1·3	0·9	7·3	4·8	13·3	8·8
14	9 48·5	9 50·1	9 21·7	1·4	0·9	7·4	4·9	13·4	8·8
15	9 48·8	9 50·4	9 21·9	1·5	1·0	7·5	4·9	13·5	8·9
16	9 49·0	9 50·6	9 22·2	1·6	1·1	7·6	5·0	13·6	9·0
17	9 49·3	9 50·9	9 22·4	1·7	1·1	7·7	5·1	13·7	9·0
18	9 49·5	9 51·1	9 22·6	1·8	1·2	7·8	5·1	13·8	9·1
19	9 49·8	9 51·4	9 22·9	1·9	1·3	7·9	5·2	13·9	9·2
20	9 50·0	9 51·6	9 23·1	2·0	1·3	8·0	5·3	14·0	9·2
21	9 50·3	9 51·9	9 23·4	2·1	1·4	8·1	5·3	14·1	9·3
22	9 50·5	9 52·1	9 23·6	2·2	1·4	8·2	5·4	14·2	9·3
23	9 50·8	9 52·4	9 23·8	2·3	1·5	8·3	5·5	14·3	9·4
24	9 51·0	9 52·6	9 24·1	2·4	1·6	8·4	5·5	14·4	9·5
25	9 51·3	9 52·9	9 24·3	2·5	1·6	8·5	5·6	14·5	9·5
26	9 51·5	9 53·1	9 24·6	2·6	1·7	8·6	5·7	14·6	9·6
27	9 51·8	9 53·4	9 24·8	2·7	1·8	8·7	5·7	14·7	9·7
28	9 52·0	9 53·6	9 25·0	2·8	1·8	8·8	5·8	14·8	9·7
29	9 52·3	9 53·9	9 25·3	2·9	1·9	8·9	5·9	14·9	9·8
30	9 52·5	9 54·1	9 25·5	3·0	2·0	9·0	5·9	15·0	9·9
31	9 52·8	9 54·4	9 25·7	3·1	2·0	9·1	6·0	15·1	9·9
32	9 53·0	9 54·6	9 26·0	3·2	2·1	9·2	6·1	15·2	10·0
33	9 53·3	9 54·9	9 26·2	3·3	2·2	9·3	6·1	15·3	10·1
34	9 53·5	9 55·1	9 26·5	3·4	2·2	9·4	6·2	15·4	10·1
35	9 53·8	9 55·4	9 26·7	3·5	2·3	9·5	6·3	15·5	10·2
36	9 54·0	9 55·6	9 26·9	3·6	2·4	9·6	6·3	15·6	10·3
37	9 54·3	9 55·9	9 27·2	3·7	2·4	9·7	6·4	15·7	10·3
38	9 54·5	9 56·1	9 27·4	3·8	2·5	9·8	6·5	15·8	10·4
39	9 54·8	9 56·4	9 27·7	3·9	2·6	9·9	6·5	15·9	10·5
40	9 55·0	9 56·6	9 27·9	4·0	2·6	10·0	6·6	16·0	10·5
41	9 55·3	9 56·9	9 28·1	4·1	2·7	10·1	6·6	16·1	10·6
42	9 55·5	9 57·1	9 28·4	4·2	2·8	10·2	6·7	16·2	10·7
43	9 55·8	9 57·4	9 28·6	4·3	2·8	10·3	6·8	16·3	10·7
44	9 56·0	9 57·6	9 28·8	4·4	2·9	10·4	6·8	16·4	10·8
45	9 56·3	9 57·9	9 29·1	4·5	3·0	10·5	6·9	16·5	10·9
46	9 56·5	9 58·1	9 29·3	4·6	3·0	10·6	7·0	16·6	10·9
47	9 56·8	9 58·4	9 29·6	4·7	3·1	10·7	7·0	16·7	11·0
48	9 57·0	9 58·6	9 29·8	4·8	3·2	10·8	7·1	16·8	11·1
49	9 57·3	9 58·9	9 30·0	4·9	3·2	10·9	7·2	16·9	11·1
50	9 57·5	9 59·1	9 30·3	5·0	3·3	11·0	7·2	17·0	11·2
51	9 57·8	9 59·4	9 30·5	5·1	3·4	11·1	7·3	17·1	11·3
52	9 58·0	9 59·6	9 30·8	5·2	3·4	11·2	7·4	17·2	11·3
53	9 58·3	9 59·9	9 31·0	5·3	3·5	11·3	7·4	17·3	11·4
54	9 58·5	10 00·1	9 31·2	5·4	3·6	11·4	7·5	17·4	11·5
55	9 58·8	10 00·4	9 31·5	5·5	3·6	11·5	7·6	17·5	11·5
56	9 59·0	10 00·6	9 31·7	5·6	3·7	11·6	7·6	17·6	11·6
57	9 59·3	10 00·9	9 32·0	5·7	3·8	11·7	7·7	17·7	11·7
58	9 59·5	10 01·1	9 32·2	5·8	3·8	11·8	7·8	17·8	11·7
59	9 59·8	10 01·4	9 32·4	5·9	3·9	11·9	7·8	17·9	11·8
60	10 00·0	10 01·6	9 32·7	6·0	4·0	12·0	7·9	18·0	11·9

^{m} 40	SUN PLANETS	ARIES	MOON	v or d	Corr^n	v or d	Corr^n	v or d	Corr^n
s	° ′	° ′	° ′	′	′	′	′	′	′
00	10 00·0	10 01·6	9 32·7	0·0	0·0	6·0	4·1	12·0	8·1
01	10 00·3	10 01·9	9 32·9	0·1	0·1	6·1	4·1	12·1	8·2
02	10 00·5	10 02·1	9 33·1	0·2	0·1	6·2	4·2	12·2	8·2
03	10 00·8	10 02·4	9 33·4	0·3	0·2	6·3	4·3	12·3	8·3
04	10 01·0	10 02·6	9 33·6	0·4	0·3	6·4	4·3	12·4	8·4
05	10 01·3	10 02·9	9 33·9	0·5	0·3	6·5	4·4	12·5	8·4
06	10 01·5	10 03·1	9 34·1	0·6	0·4	6·6	4·5	12·6	8·5
07	10 01·8	10 03·4	9 34·3	0·7	0·5	6·7	4·5	12·7	8·6
08	10 02·0	10 03·6	9 34·6	0·8	0·5	6·8	4·6	12·8	8·6
09	10 02·3	10 03·9	9 34·8	0·9	0·6	6·9	4·7	12·9	8·7
10	10 02·5	10 04·1	9 35·1	1·0	0·7	7·0	4·7	13·0	8·8
11	10 02·8	10 04·4	9 35·3	1·1	0·7	7·1	4·8	13·1	8·8
12	10 03·0	10 04·7	9 35·5	1·2	0·8	7·2	4·9	13·2	8·9
13	10 03·3	10 04·9	9 35·8	1·3	0·9	7·3	4·9	13·3	9·0
14	10 03·5	10 05·2	9 36·0	1·4	0·9	7·4	5·0	13·4	9·0
15	10 03·8	10 05·4	9 36·2	1·5	1·0	7·5	5·1	13·5	9·1
16	10 04·0	10 05·7	9 36·5	1·6	1·1	7·6	5·1	13·6	9·2
17	10 04·3	10 05·9	9 36·7	1·7	1·1	7·7	5·2	13·7	9·2
18	10 04·5	10 06·2	9 37·0	1·8	1·2	7·8	5·3	13·8	9·3
19	10 04·8	10 06·4	9 37·2	1·9	1·3	7·9	5·3	13·9	9·4
20	10 05·0	10 06·7	9 37·4	2·0	1·4	8·0	5·4	14·0	9·5
21	10 05·3	10 06·9	9 37·7	2·1	1·4	8·1	5·5	14·1	9·5
22	10 05·5	10 07·2	9 37·9	2·2	1·5	8·2	5·5	14·2	9·6
23	10 05·8	10 07·4	9 38·2	2·3	1·6	8·3	5·6	14·3	9·7
24	10 06·0	10 07·7	9 38·4	2·4	1·6	8·4	5·7	14·4	9·7
25	10 06·3	10 07·9	9 38·6	2·5	1·7	8·5	5·7	14·5	9·8
26	10 06·5	10 08·2	9 38·9	2·6	1·8	8·6	5·8	14·6	9·9
27	10 06·8	10 08·4	9 39·1	2·7	1·8	8·7	5·9	14·7	9·9
28	10 07·0	10 08·7	9 39·3	2·8	1·9	8·8	5·9	14·8	10·0
29	10 07·3	10 08·9	9 39·6	2·9	2·0	8·9	6·0	14·9	10·1
30	10 07·5	10 09·2	9 39·8	3·0	2·0	9·0	6·1	15·0	10·1
31	10 07·8	10 09·4	9 40·1	3·1	2·1	9·1	6·1	15·1	10·2
32	10 08·0	10 09·7	9 40·3	3·2	2·2	9·2	6·2	15·2	10·3
33	10 08·3	10 09·9	9 40·5	3·3	2·2	9·3	6·3	15·3	10·3
34	10 08·5	10 10·2	9 40·8	3·4	2·3	9·4	6·3	15·4	10·4
35	10 08·8	10 10·4	9 41·0	3·5	2·4	9·5	6·4	15·5	10·5
36	10 09·0	10 10·7	9 41·3	3·6	2·4	9·6	6·5	15·6	10·5
37	10 09·3	10 10·9	9 41·5	3·7	2·5	9·7	6·5	15·7	10·6
38	10 09·5	10 11·2	9 41·7	3·8	2·6	9·8	6·6	15·8	10·7
39	10 09·8	10 11·4	9 42·0	3·9	2·6	9·9	6·7	15·9	10·7
40	10 10·0	10 11·7	9 42·2	4·0	2·7	10·0	6·8	16·0	10·8
41	10 10·3	10 11·9	9 42·4	4·1	2·8	10·1	6·8	16·1	10·9
42	10 10·5	10 12·2	9 42·7	4·2	2·8	10·2	6·9	16·2	10·9
43	10 10·8	10 12·4	9 42·9	4·3	2·9	10·3	7·0	16·3	11·0
44	10 11·0	10 12·7	9 43·2	4·4	3·0	10·4	7·0	16·4	11·1
45	10 11·3	10 12·9	9 43·4	4·5	3·0	10·5	7·1	16·5	11·1
46	10 11·5	10 13·2	9 43·6	4·6	3·1	10·6	7·2	16·6	11·2
47	10 11·8	10 13·4	9 43·9	4·7	3·2	10·7	7·2	16·7	11·3
48	10 12·0	10 13·7	9 44·1	4·8	3·2	10·8	7·3	16·8	11·3
49	10 12·3	10 13·9	9 44·4	4·9	3·3	10·9	7·4	16·9	11·4
50	10 12·5	10 14·2	9 44·6	5·0	3·4	11·0	7·4	17·0	11·5
51	10 12·8	10 14·4	9 44·8	5·1	3·4	11·1	7·5	17·1	11·5
52	10 13·0	10 14·7	9 45·1	5·2	3·5	11·2	7·6	17·2	11·6
53	10 13·3	10 14·9	9 45·3	5·3	3·6	11·3	7·6	17·3	11·7
54	10 13·5	10 15·2	9 45·6	5·4	3·6	11·4	7·7	17·4	11·7
55	10 13·8	10 15·4	9 45·8	5·5	3·7	11·5	7·8	17·5	11·8
56	10 14·0	10 15·7	9 46·0	5·6	3·8	11·6	7·8	17·6	11·9
57	10 14·3	10 15·9	9 46·3	5·7	3·8	11·7	7·9	17·7	11·9
58	10 14·5	10 16·2	9 46·5	5·8	3·9	11·8	8·0	17·8	12·0
59	10 14·8	10 16·4	9 46·7	5·9	4·0	11·9	8·0	17·9	12·1
60	10 15·0	10 16·7	9 47·0	6·0	4·1	12·0	8·1	18·0	12·2

^{m} 41	SUN PLANETS	ARIES	MOON	v or d	Corr^n	v or d	Corr^n	v or d	Corr^n
s	° ′	° ′	° ′	′	′	′	′	′	′
00	10 15·0	10 16·7	9 47·0	0·0	0·0	6·0	4·2	12·0	8·3
01	10 15·3	10 16·9	9 47·2	0·1	0·1	6·1	4·2	12·1	8·4
02	10 15·5	10 17·2	9 47·5	0·2	0·1	6·2	4·3	12·2	8·4
03	10 15·8	10 17·4	9 47·7	0·3	0·2	6·3	4·4	12·3	8·5
04	10 16·0	10 17·7	9 47·9	0·4	0·3	6·4	4·4	12·4	8·6
05	10 16·3	10 17·9	9 48·2	0·5	0·3	6·5	4·5	12·5	8·6
06	10 16·5	10 18·2	9 48·4	0·6	0·4	6·6	4·6	12·6	8·7
07	10 16·8	10 18·4	9 48·7	0·7	0·5	6·7	4·6	12·7	8·8
08	10 17·0	10 18·7	9 48·9	0·8	0·6	6·8	4·7	12·8	8·9
09	10 17·3	10 18·9	9 49·1	0·9	0·6	6·9	4·8	12·9	8·9
10	10 17·5	10 19·2	9 49·4	1·0	0·7	7·0	4·8	13·0	9·0
11	10 17·8	10 19·4	9 49·6	1·1	0·8	7·1	4·9	13·1	9·1
12	10 18·0	10 19·7	9 49·8	1·2	0·8	7·2	5·0	13·2	9·1
13	10 18·3	10 19·9	9 50·1	1·3	0·9	7·3	5·0	13·3	9·2
14	10 18·5	10 20·2	9 50·3	1·4	1·0	7·4	5·1	13·4	9·3
15	10 18·8	10 20·4	9 50·6	1·5	1·0	7·5	5·2	13·5	9·3
16	10 19·0	10 20·7	9 50·8	1·6	1·1	7·6	5·3	13·6	9·4
17	10 19·3	10 20·9	9 51·0	1·7	1·2	7·7	5·3	13·7	9·5
18	10 19·5	10 21·2	9 51·3	1·8	1·2	7·8	5·4	13·8	9·5
19	10 19·8	10 21·4	9 51·5	1·9	1·3	7·9	5·5	13·9	9·6
20	10 20·0	10 21·7	9 51·8	2·0	1·4	8·0	5·5	14·0	9·7
21	10 20·3	10 21·9	9 52·0	2·1	1·5	8·1	5·6	14·1	9·8
22	10 20·5	10 22·2	9 52·2	2·2	1·5	8·2	5·7	14·2	9·8
23	10 20·8	10 22·4	9 52·5	2·3	1·6	8·3	5·7	14·3	9·9
24	10 21·0	10 22·7	9 52·7	2·4	1·7	8·4	5·8	14·4	10·0
25	10 21·3	10 23·0	9 52·9	2·5	1·7	8·5	5·9	14·5	10·0
26	10 21·5	10 23·2	9 53·2	2·6	1·8	8·6	5·9	14·6	10·1
27	10 21·8	10 23·5	9 53·4	2·7	1·9	8·7	6·0	14·7	10·2
28	10 22·0	10 23·7	9 53·7	2·8	1·9	8·8	6·1	14·8	10·2
29	10 22·3	10 24·0	9 53·9	2·9	2·0	8·9	6·2	14·9	10·3
30	10 22·5	10 24·2	9 54·1	3·0	2·1	9·0	6·2	15·0	10·4
31	10 22·8	10 24·5	9 54·4	3·1	2·1	9·1	6·3	15·1	10·4
32	10 23·0	10 24·7	9 54·6	3·2	2·2	9·2	6·4	15·2	10·5
33	10 23·3	10 25·0	9 54·9	3·3	2·3	9·3	6·4	15·3	10·6
34	10 23·5	10 25·2	9 55·1	3·4	2·4	9·4	6·5	15·4	10·7
35	10 23·8	10 25·5	9 55·3	3·5	2·4	9·5	6·6	15·5	10·7
36	10 24·0	10 25·7	9 55·6	3·6	2·5	9·6	6·6	15·6	10·8
37	10 24·3	10 26·0	9 55·8	3·7	2·6	9·7	6·7	15·7	10·9
38	10 24·5	10 26·2	9 56·1	3·8	2·6	9·8	6·8	15·8	10·9
39	10 24·8	10 26·5	9 56·3	3·9	2·7	9·9	6·8	15·9	11·0
40	10 25·0	10 26·7	9 56·5	4·0	2·8	10·0	6·9	16·0	11·1
41	10 25·3	10 27·0	9 56·8	4·1	2·8	10·1	7·0	16·1	11·1
42	10 25·5	10 27·2	9 57·0	4·2	2·9	10·2	7·1	16·2	11·2
43	10 25·8	10 27·5	9 57·2	4·3	3·0	10·3	7·1	16·3	11·3
44	10 26·0	10 27·7	9 57·5	4·4	3·0	10·4	7·2	16·4	11·3
45	10 26·3	10 28·0	9 57·7	4·5	3·1	10·5	7·3	16·5	11·4
46	10 26·5	10 28·2	9 58·0	4·6	3·2	10·6	7·3	16·6	11·5
47	10 26·8	10 28·5	9 58·2	4·7	3·3	10·7	7·4	16·7	11·6
48	10 27·0	10 28·7	9 58·4	4·8	3·3	10·8	7·5	16·8	11·6
49	10 27·3	10 29·0	9 58·7	4·9	3·4	10·9	7·5	16·9	11·7
50	10 27·5	10 29·2	9 58·9	5·0	3·5	11·0	7·6	17·0	11·8
51	10 27·8	10 29·5	9 59·2	5·1	3·5	11·1	7·7	17·1	11·8
52	10 28·0	10 29·7	9 59·4	5·2	3·6	11·2	7·7	17·2	11·9
53	10 28·3	10 30·0	9 59·6	5·3	3·7	11·3	7·8	17·3	12·0
54	10 28·5	10 30·2	9 59·9	5·4	3·7	11·4	7·9	17·4	12·0
55	10 28·8	10 30·5	10 00·1	5·5	3·8	11·5	8·0	17·5	12·1
56	10 29·0	10 30·7	10 00·3	5·6	3·9	11·6	8·0	17·6	12·2
57	10 29·3	10 31·0	10 00·6	5·7	3·9	11·7	8·1	17·7	12·2
58	10 29·5	10 31·2	10 00·8	5·8	4·0	11·8	8·2	17·8	12·3
59	10 29·8	10 31·5	10 01·1	5·9	4·1	11·9	8·2	17·9	12·4
60	10 30·0	10 31·7	10 01·3	6·0	4·2	12·0	8·3	18·0	12·5

42^{m}	SUN PLANETS	ARIES	MOON	v or d	Corr^{n}	v or d	Corr^{n}	v or d	Corr^{n}
s	° ′	° ′	° ′	′	′	′	′	′	′
00	10 30·0	10 31·7	10 01·3	0·0	0·0	6·0	4·3	12·0	8·5
01	10 30·3	10 32·0	10 01·5	0·1	0·1	6·1	4·3	12·1	8·6
02	10 30·5	10 32·2	10 01·8	0·2	0·1	6·2	4·4	12·2	8·6
03	10 30·8	10 32·5	10 02·0	0·3	0·2	6·3	4·5	12·3	8·7
04	10 31·0	10 32·7	10 02·3	0·4	0·3	6·4	4·5	12·4	8·8
05	10 31·3	10 33·0	10 02·5	0·5	0·4	6·5	4·6	12·5	8·9
06	10 31·5	10 33·2	10 02·7	0·6	0·4	6·6	4·7	12·6	8·9
07	10 31·8	10 33·5	10 03·0	0·7	0·5	6·7	4·7	12·7	9·0
08	10 32·0	10 33·7	10 03·2	0·8	0·6	6·8	4·8	12·8	9·1
09	10 32·3	10 34·0	10 03·4	0·9	0·6	6·9	4·9	12·9	9·1
10	10 32·5	10 34·2	10 03·7	1·0	0·7	7·0	5·0	13·0	9·2
11	10 32·8	10 34·5	10 03·9	1·1	0·8	7·1	5·0	13·1	9·3
12	10 33·0	10 34·7	10 04·2	1·2	0·9	7·2	5·1	13·2	9·4
13	10 33·3	10 35·0	10 04·4	1·3	0·9	7·3	5·2	13·3	9·4
14	10 33·5	10 35·2	10 04·6	1·4	1·0	7·4	5·2	13·4	9·5
15	10 33·8	10 35·5	10 04·9	1·5	1·1	7·5	5·3	13·5	9·6
16	10 34·0	10 35·7	10 05·1	1·6	1·1	7·6	5·4	13·6	9·6
17	10 34·3	10 36·0	10 05·4	1·7	1·2	7·7	5·5	13·7	9·7
18	10 34·5	10 36·2	10 05·6	1·8	1·3	7·8	5·5	13·8	9·8
19	10 34·8	10 36·5	10 05·8	1·9	1·3	7·9	5·6	13·9	9·8
20	10 35·0	10 36·7	10 06·1	2·0	1·4	8·0	5·7	14·0	9·9
21	10 35·3	10 37·0	10 06·3	2·1	1·5	8·1	5·7	14·1	10·0
22	10 35·5	10 37·2	10 06·5	2·2	1·6	8·2	5·8	14·2	10·1
23	10 35·8	10 37·5	10 06·8	2·3	1·6	8·3	5·9	14·3	10·1
24	10 36·0	10 37·7	10 07·0	2·4	1·7	8·4	6·0	14·4	10·2
25	10 36·3	10 38·0	10 07·3	2·5	1·8	8·5	6·0	14·5	10·3
26	10 36·5	10 38·2	10 07·5	2·6	1·8	8·6	6·1	14·6	10·3
27	10 36·8	10 38·5	10 07·7	2·7	1·9	8·7	6·2	14·7	10·4
28	10 37·0	10 38·7	10 08·0	2·8	2·0	8·8	6·2	14·8	10·5
29	10 37·3	10 39·0	10 08·2	2·9	2·1	8·9	6·3	14·9	10·6
30	10 37·5	10 39·2	10 08·5	3·0	2·1	9·0	6·4	15·0	10·6
31	10 37·8	10 39·5	10 08·7	3·1	2·2	9·1	6·4	15·1	10·7
32	10 38·0	10 39·7	10 08·9	3·2	2·3	9·2	6·5	15·2	10·8
33	10 38·3	10 40·0	10 09·2	3·3	2·3	9·3	6·6	15·3	10·8
34	10 38·5	10 40·2	10 09·4	3·4	2·4	9·4	6·7	15·4	10·9
35	10 38·8	10 40·5	10 09·7	3·5	2·5	9·5	6·7	15·5	11·0
36	10 39·0	10 40·7	10 09·9	3·6	2·6	9·6	6·8	15·6	11·1
37	10 39·3	10 41·0	10 10·1	3·7	2·6	9·7	6·9	15·7	11·1
38	10 39·5	10 41·3	10 10·4	3·8	2·7	9·8	6·9	15·8	11·2
39	10 39·8	10 41·5	10 10·6	3·9	2·8	9·9	7·0	15·9	11·3
40	10 40·0	10 41·8	10 10·8	4·0	2·8	10·0	7·1	16·0	11·3
41	10 40·3	10 42·0	10 11·1	4·1	2·9	10·1	7·2	16·1	11·4
42	10 40·5	10 42·3	10 11·3	4·2	3·0	10·2	7·2	16·2	11·5
43	10 40·8	10 42·5	10 11·6	4·3	3·0	10·3	7·3	16·3	11·5
44	10 41·0	10 42·8	10 11·8	4·4	3·1	10·4	7·4	16·4	11·6
45	10 41·3	10 43·0	10 12·0	4·5	3·2	10·5	7·4	16·5	11·7
46	10 41·5	10 43·3	10 12·3	4·6	3·3	10·6	7·5	16·6	11·8
47	10 41·8	10 43·5	10 12·5	4·7	3·3	10·7	7·6	16·7	11·8
48	10 42·0	10 43·8	10 12·8	4·8	3·4	10·8	7·7	16·8	11·9
49	10 42·3	10 44·0	10 13·0	4·9	3·5	10·9	7·7	16·9	12·0
50	10 42·5	10 44·3	10 13·2	5·0	3·5	11·0	7·8	17·0	12·0
51	10 42·8	10 44·5	10 13·5	5·1	3·6	11·1	7·9	17·1	12·1
52	10 43·0	10 44·8	10 13·7	5·2	3·7	11·2	7·9	17·2	12·2
53	10 43·3	10 45·0	10 13·9	5·3	3·8	11·3	8·0	17·3	12·3
54	10 43·5	10 45·3	10 14·2	5·4	3·8	11·4	8·1	17·4	12·3
55	10 43·8	10 45·5	10 14·4	5·5	3·9	11·5	8·1	17·5	12·4
56	10 44·0	10 45·8	10 14·7	5·6	4·0	11·6	8·2	17·6	12·5
57	10 44·3	10 46·0	10 14·9	5·7	4·0	11·7	8·3	17·7	12·5
58	10 44·5	10 46·3	10 15·1	5·8	4·1	11·8	8·4	17·8	12·6
59	10 44·8	10 46·5	10 15·4	5·9	4·2	11·9	8·4	17·9	12·7
60	10 45·0	10 46·8	10 15·6	6·0	4·3	12·0	8·5	18·0	12·8

43^{m}	SUN PLANETS	ARIES	MOON	v or d	Corr^{n}	v or d	Corr^{n}	v or d	Corr^{n}
s	° ′	° ′	° ′	′	′	′	′	′	′
00	10 45·0	10 46·8	10 15·6	0·0	0·0	6·0	4·4	12·0	8·7
01	10 45·3	10 47·0	10 15·9	0·1	0·1	6·1	4·4	12·1	8·8
02	10 45·5	10 47·3	10 16·1	0·2	0·1	6·2	4·5	12·2	8·8
03	10 45·8	10 47·5	10 16·3	0·3	0·2	6·3	4·6	12·3	8·9
04	10 46·0	10 47·8	10 16·6	0·4	0·3	6·4	4·6	12·4	9·0
05	10 46·3	10 48·0	10 16·8	0·5	0·4	6·5	4·7	12·5	9·1
06	10 46·5	10 48·3	10 17·0	0·6	0·4	6·6	4·8	12·6	9·1
07	10 46·8	10 48·5	10 17·3	0·7	0·5	6·7	4·9	12·7	9·2
08	10 47·0	10 48·8	10 17·5	0·8	0·6	6·8	4·9	12·8	9·3
09	10 47·3	10 49·0	10 17·8	0·9	0·7	6·9	5·0	12·9	9·4
10	10 47·5	10 49·3	10 18·0	1·0	0·7	7·0	5·1	13·0	9·4
11	10 47·8	10 49·5	10 18·2	1·1	0·8	7·1	5·1	13·1	9·5
12	10 48·0	10 49·8	10 18·5	1·2	0·9	7·2	5·2	13·2	9·6
13	10 48·3	10 50·0	10 18·7	1·3	0·9	7·3	5·3	13·3	9·6
14	10 48·5	10 50·3	10 19·0	1·4	1·0	7·4	5·4	13·4	9·7
15	10 48·8	10 50·5	10 19·2	1·5	1·1	7·5	5·4	13·5	9·8
16	10 49·0	10 50·8	10 19·4	1·6	1·2	7·6	5·5	13·6	9·9
17	10 49·3	10 51·0	10 19·7	1·7	1·2	7·7	5·6	13·7	9·9
18	10 49·5	10 51·3	10 19·9	1·8	1·3	7·8	5·7	13·8	10·0
19	10 49·8	10 51·5	10 20·2	1·9	1·4	7·9	5·7	13·9	10·1
20	10 50·0	10 51·8	10 20·4	2·0	1·5	8·0	5·8	14·0	10·2
21	10 50·3	10 52·0	10 20·6	2·1	1·5	8·1	5·9	14·1	10·2
22	10 50·5	10 52·3	10 20·9	2·2	1·6	8·2	5·9	14·2	10·3
23	10 50·8	10 52·5	10 21·1	2·3	1·7	8·3	6·0	14·3	10·4
24	10 51·0	10 52·8	10 21·3	2·4	1·7	8·4	6·1	14·4	10·4
25	10 51·3	10 53·0	10 21·6	2·5	1·8	8·5	6·2	14·5	10·5
26	10 51·5	10 53·3	10 21·8	2·6	1·9	8·6	6·2	14·6	10·6
27	10 51·8	10 53·5	10 22·1	2·7	2·0	8·7	6·3	14·7	10·7
28	10 52·0	10 53·8	10 22·3	2·8	2·0	8·8	6·4	14·8	10·7
29	10 52·3	10 54·0	10 22·5	2·9	2·1	8·9	6·5	14·9	10·8
30	10 52·5	10 54·3	10 22·8	3·0	2·2	9·0	6·5	15·0	10·9
31	10 52·8	10 54·5	10 23·0	3·1	2·2	9·1	6·6	15·1	10·9
32	10 53·0	10 54·8	10 23·3	3·2	2·3	9·2	6·7	15·2	11·0
33	10 53·3	10 55·0	10 23·5	3·3	2·4	9·3	6·7	15·3	11·1
34	10 53·5	10 55·3	10 23·7	3·4	2·5	9·4	6·8	15·4	11·2
35	10 53·8	10 55·5	10 24·0	3·5	2·5	9·5	6·9	15·5	11·2
36	10 54·0	10 55·8	10 24·2	3·6	2·6	9·6	7·0	15·6	11·3
37	10 54·3	10 56·0	10 24·4	3·7	2·7	9·7	7·0	15·7	11·4
38	10 54·5	10 56·3	10 24·7	3·8	2·8	9·8	7·1	15·8	11·5
39	10 54·8	10 56·5	10 24·9	3·9	2·8	9·9	7·2	15·9	11·5
40	10 55·0	10 56·8	10 25·2	4·0	2·9	10·0	7·3	16·0	11·6
41	10 55·3	10 57·0	10 25·4	4·1	3·0	10·1	7·3	16·1	11·7
42	10 55·5	10 57·3	10 25·6	4·2	3·0	10·2	7·4	16·2	11·7
43	10 55·8	10 57·5	10 25·9	4·3	3·1	10·3	7·5	16·3	11·8
44	10 56·0	10 57·8	10 26·1	4·4	3·2	10·4	7·5	16·4	11·9
45	10 56·3	10 58·0	10 26·4	4·5	3·3	10·5	7·6	16·5	12·0
46	10 56·5	10 58·3	10 26·6	4·6	3·3	10·6	7·7	16·6	12·0
47	10 56·8	10 58·5	10 26·8	4·7	3·4	10·7	7·8	16·7	12·1
48	10 57·0	10 58·8	10 27·1	4·8	3·5	10·8	7·8	16·8	12·2
49	10 57·3	10 59·0	10 27·3	4·9	3·6	10·9	7·9	16·9	12·3
50	10 57·5	10 59·3	10 27·5	5·0	3·6	11·0	8·0	17·0	12·3
51	10 57·8	10 59·6	10 27·8	5·1	3·7	11·1	8·0	17·1	12·4
52	10 58·0	10 59·8	10 28·0	5·2	3·8	11·2	8·1	17·2	12·5
53	10 58·3	11 00·1	10 28·3	5·3	3·8	11·3	8·2	17·3	12·5
54	10 58·5	11 00·3	10 28·5	5·4	3·9	11·4	8·3	17·4	12·6
55	10 58·8	11 00·6	10 28·7	5·5	4·0	11·5	8·3	17·5	12·7
56	10 59·0	11 00·8	10 29·0	5·6	4·1	11·6	8·4	17·6	12·8
57	10 59·3	11 01·1	10 29·2	5·7	4·1	11·7	8·5	17·7	12·8
58	10 59·5	11 01·3	10 29·5	5·8	4·2	11·8	8·6	17·8	12·9
59	10 59·8	11 01·6	10 29·7	5·9	4·3	11·9	8·6	17·9	13·0
60	11 00·0	11 01·8	10 29·9	6·0	4·4	12·0	8·7	18·0	13·1

m 44	SUN PLANETS	ARIES	MOON	v or d	Corrⁿ	v or d	Corrⁿ	v or d	Corrⁿ
s	° ′	° ′	° ′	′	′	′	′	′	′
00	11 00·0	11 01·8	10 29·9	0·0	0·0	6·0	4·5	12·0	8·9
01	11 00·3	11 02·1	10 30·2	0·1	0·1	6·1	4·5	12·1	9·0
02	11 00·5	11 02·3	10 30·4	0·2	0·1	6·2	4·6	12·2	9·0
03	11 00·8	11 02·6	10 30·6	0·3	0·2	6·3	4·7	12·3	9·1
04	11 01·0	11 02·8	10 30·9	0·4	0·3	6·4	4·7	12·4	9·2
05	11 01·3	11 03·1	10 31·1	0·5	0·4	6·5	4·8	12·5	9·3
06	11 01·5	11 03·3	10 31·4	0·6	0·4	6·6	4·9	12·6	9·3
07	11 01·8	11 03·6	10 31·6	0·7	0·5	6·7	5·0	12·7	9·4
08	11 02·0	11 03·8	10 31·8	0·8	0·6	6·8	5·0	12·8	9·5
09	11 02·3	11 04·1	10 32·1	0·9	0·7	6·9	5·1	12·9	9·6
10	11 02·5	11 04·3	10 32·3	1·0	0·7	7·0	5·2	13·0	9·6
11	11 02·8	11 04·6	10 32·6	1·1	0·8	7·1	5·3	13·1	9·7
12	11 03·0	11 04·8	10 32·8	1·2	0·9	7·2	5·3	13·2	9·8
13	11 03·3	11 05·1	10 33·0	1·3	1·0	7·3	5·4	13·3	9·9
14	11 03·5	11 05·3	10 33·3	1·4	1·0	7·4	5·5	13·4	9·9
15	11 03·8	11 05·6	10 33·5	1·5	1·1	7·5	5·6	13·5	10·0
16	11 04·0	11 05·8	10 33·8	1·6	1·2	7·6	5·6	13·6	10·1
17	11 04·3	11 06·1	10 34·0	1·7	1·3	7·7	5·7	13·7	10·2
18	11 04·5	11 06·3	10 34·2	1·8	1·3	7·8	5·8	13·8	10·2
19	11 04·8	11 06·6	10 34·5	1·9	1·4	7·9	5·9	13·9	10·3
20	11 05·0	11 06·8	10 34·7	2·0	1·5	8·0	5·9	14·0	10·4
21	11 05·3	11 07·1	10 34·9	2·1	1·6	8·1	6·0	14·1	10·5
22	11 05·5	11 07·3	10 35·2	2·2	1·6	8·2	6·1	14·2	10·5
23	11 05·8	11 07·6	10 35·4	2·3	1·7	8·3	6·2	14·3	10·6
24	11 06·0	11 07·8	10 35·7	2·4	1·8	8·4	6·2	14·4	10·7
25	11 06·3	11 08·1	10 35·9	2·5	1·9	8·5	6·3	14·5	10·8
26	11 06·5	11 08·3	10 36·1	2·6	1·9	8·6	6·4	14·6	10·8
27	11 06·8	11 08·6	10 36·4	2·7	2·0	8·7	6·5	14·7	10·9
28	11 07·0	11 08·8	10 36·6	2·8	2·1	8·8	6·5	14·8	11·0
29	11 07·3	11 09·1	10 36·9	2·9	2·2	8·9	6·6	14·9	11·1
30	11 07·5	11 09·3	10 37·1	3·0	2·2	9·0	6·7	15·0	11·1
31	11 07·8	11 09·6	10 37·3	3·1	2·3	9·1	6·7	15·1	11·2
32	11 08·0	11 09·8	10 37·6	3·2	2·4	9·2	6·8	15·2	11·3
33	11 08·3	11 10·1	10 37·8	3·3	2·4	9·3	6·9	15·3	11·3
34	11 08·5	11 10·3	10 38·0	3·4	2·5	9·4	7·0	15·4	11·4
35	11 08·8	11 10·6	10 38·3	3·5	2·6	9·5	7·0	15·5	11·5
36	11 09·0	11 10·8	10 38·5	3·6	2·7	9·6	7·1	15·6	11·6
37	11 09·3	11 11·1	10 38·8	3·7	2·7	9·7	7·2	15·7	11·6
38	11 09·5	11 11·3	10 39·0	3·8	2·8	9·8	7·3	15·8	11·7
39	11 09·8	11 11·6	10 39·2	3·9	2·9	9·9	7·3	15·9	11·8
40	11 10·0	11 11·8	10 39·5	4·0	3·0	10·0	7·4	16·0	11·9
41	11 10·3	11 12·1	10 39·7	4·1	3·0	10·1	7·5	16·1	11·9
42	11 10·5	11 12·3	10 40·0	4·2	3·1	10·2	7·6	16·2	12·0
43	11 10·8	11 12·6	10 40·2	4·3	3·2	10·3	7·6	16·3	12·1
44	11 11·0	11 12·8	10 40·4	4·4	3·3	10·4	7·7	16·4	12·2
45	11 11·3	11 13·1	10 40·7	4·5	3·3	10·5	7·8	16·5	12·2
46	11 11·5	11 13·3	10 40·9	4·6	3·4	10·6	7·9	16·6	12·3
47	11 11·8	11 13·6	10 41·1	4·7	3·5	10·7	7·9	16·7	12·4
48	11 12·0	11 13·8	10 41·4	4·8	3·6	10·8	8·0	16·8	12·5
49	11 12·3	11 14·1	10 41·6	4·9	3·6	10·9	8·1	16·9	12·5
50	11 12·5	11 14·3	10 41·9	5·0	3·7	11·0	8·2	17·0	12·6
51	11 12·8	11 14·6	10 42·1	5·1	3·8	11·1	8·2	17·1	12·7
52	11 13·0	11 14·8	10 42·3	5·2	3·9	11·2	8·3	17·2	12·8
53	11 13·3	11 15·1	10 42·6	5·3	3·9	11·3	8·4	17·3	12·8
54	11 13·5	11 15·3	10 42·8	5·4	4·0	11·4	8·5	17·4	12·9
55	11 13·8	11 15·6	10 43·1	5·5	4·1	11·5	8·5	17·5	13·0
56	11 14·0	11 15·8	10 43·3	5·6	4·2	11·6	8·6	17·6	13·1
57	11 14·3	11 16·1	10 43·5	5·7	4·2	11·7	8·7	17·7	13·1
58	11 14·5	11 16·3	10 43·8	5·8	4·3	11·8	8·8	17·8	13·2
59	11 14·8	11 16·6	10 44·0	5·9	4·4	11·9	8·8	17·9	13·3
60	11 15·0	11 16·8	10 44·3	6·0	4·5	12·0	8·9	18·0	13·4

m 45	SUN PLANETS	ARIES	MOON	v or d	Corrⁿ	v or d	Corrⁿ	v or d	Corrⁿ
s	° ′	° ′	° ′	′	′	′	′	′	′
00	11 15·0	11 16·8	10 44·3	0·0	0·0	6·0	4·6	12·0	9·1
01	11 15·3	11 17·1	10 44·5	0·1	0·1	6·1	4·6	12·1	9·2
02	11 15·5	11 17·3	10 44·7	0·2	0·2	6·2	4·7	12·2	9·3
03	11 15·8	11 17·6	10 45·0	0·3	0·2	6·3	4·8	12·3	9·3
04	11 16·0	11 17·9	10 45·2	0·4	0·3	6·4	4·9	12·4	9·4
05	11 16·3	11 18·1	10 45·4	0·5	0·4	6·5	4·9	12·5	9·5
06	11 16·5	11 18·4	10 45·7	0·6	0·5	6·6	5·0	12·6	9·6
07	11 16·8	11 18·6	10 45·9	0·7	0·5	6·7	5·1	12·7	9·6
08	11 17·0	11 18·9	10 46·2	0·8	0·6	6·8	5·2	12·8	9·7
09	11 17·3	11 19·1	10 46·4	0·9	0·7	6·9	5·2	12·9	9·8
10	11 17·5	11 19·4	10 46·6	1·0	0·8	7·0	5·3	13·0	9·9
11	11 17·8	11 19·6	10 46·9	1·1	0·8	7·1	5·4	13·1	9·9
12	11 18·0	11 19·9	10 47·1	1·2	0·9	7·2	5·5	13·2	10·0
13	11 18·3	11 20·1	10 47·4	1·3	1·0	7·3	5·5	13·3	10·1
14	11 18·5	11 20·4	10 47·6	1·4	1·1	7·4	5·6	13·4	10·2
15	11 18·8	11 20·6	10 47·8	1·5	1·1	7·5	5·7	13·5	10·2
16	11 19·0	11 20·9	10 48·1	1·6	1·2	7·6	5·8	13·6	10·3
17	11 19·3	11 21·1	10 48·3	1·7	1·3	7·7	5·8	13·7	10·4
18	11 19·5	11 21·4	10 48·5	1·8	1·4	7·8	5·9	13·8	10·5
19	11 19·8	11 21·6	10 48·8	1·9	1·4	7·9	6·0	13·9	10·5
20	11 20·0	11 21·9	10 49·0	2·0	1·5	8·0	6·1	14·0	10·6
21	11 20·3	11 22·1	10 49·3	2·1	1·6	8·1	6·1	14·1	10·7
22	11 20·5	11 22·4	10 49·5	2·2	1·7	8·2	6·2	14·2	10·8
23	11 20·8	11 22·6	10 49·7	2·3	1·7	8·3	6·3	14·3	10·8
24	11 21·0	11 22·9	10 50·0	2·4	1·8	8·4	6·4	14·4	10·9
25	11 21·3	11 23·1	10 50·2	2·5	1·9	8·5	6·4	14·5	11·0
26	11 21·5	11 23·4	10 50·5	2·6	2·0	8·6	6·5	14·6	11·1
27	11 21·8	11 23·6	10 50·7	2·7	2·0	8·7	6·6	14·7	11·1
28	11 22·0	11 23·9	10 50·9	2·8	2·1	8·8	6·7	14·8	11·2
29	11 22·3	11 24·1	10 51·2	2·9	2·2	8·9	6·7	14·9	11·3
30	11 22·5	11 24·4	10 51·4	3·0	2·3	9·0	6·8	15·0	11·4
31	11 22·8	11 24·6	10 51·6	3·1	2·4	9·1	6·9	15·1	11·5
32	11 23·0	11 24·9	10 51·9	3·2	2·4	9·2	7·0	15·2	11·5
33	11 23·3	11 25·1	10 52·1	3·3	2·5	9·3	7·1	15·3	11·6
34	11 23·5	11 25·4	10 52·4	3·4	2·6	9·4	7·1	15·4	11·7
35	11 23·8	11 25·6	10 52·6	3·5	2·7	9·5	7·2	15·5	11·8
36	11 24·0	11 25·9	10 52·8	3·6	2·7	9·6	7·3	15·6	11·8
37	11 24·3	11 26·1	10 53·1	3·7	2·8	9·7	7·4	15·7	11·9
38	11 24·5	11 26·4	10 53·3	3·8	2·9	9·8	7·4	15·8	12·0
39	11 24·8	11 26·6	10 53·6	3·9	3·0	9·9	7·5	15·9	12·1
40	11 25·0	11 26·9	10 53·8	4·0	3·0	10·0	7·6	16·0	12·1
41	11 25·3	11 27·1	10 54·0	4·1	3·1	10·1	7·7	16·1	12·2
42	11 25·5	11 27·4	10 54·3	4·2	3·2	10·2	7·7	16·2	12·3
43	11 25·8	11 27·6	10 54·5	4·3	3·3	10·3	7·8	16·3	12·4
44	11 26·0	11 27·9	10 54·7	4·4	3·3	10·4	7·9	16·4	12·4
45	11 26·3	11 28·1	10 55·0	4·5	3·4	10·5	8·0	16·5	12·5
46	11 26·5	11 28·4	10 55·2	4·6	3·5	10·6	8·0	16·6	12·6
47	11 26·8	11 28·6	10 55·5	4·7	3·6	10·7	8·1	16·7	12·7
48	11 27·0	11 28·9	10 55·7	4·8	3·6	10·8	8·2	16·8	12·7
49	11 27·3	11 29·1	10 55·9	4·9	3·7	10·9	8·3	16·9	12·8
50	11 27·5	11 29·4	10 56·2	5·0	3·8	11·0	8·3	17·0	12·9
51	11 27·8	11 29·6	10 56·4	5·1	3·9	11·1	8·4	17·1	13·0
52	11 28·0	11 29·9	10 56·7	5·2	3·9	11·2	8·5	17·2	13·0
53	11 28·3	11 30·1	10 56·9	5·3	4·0	11·3	8·6	17·3	13·1
54	11 28·5	11 30·4	10 57·1	5·4	4·1	11·4	8·6	17·4	13·2
55	11 28·8	11 30·6	10 57·4	5·5	4·2	11·5	8·7	17·5	13·3
56	11 29·0	11 30·9	10 57·6	5·6	4·2	11·6	8·8	17·6	13·3
57	11 29·3	11 31·1	10 57·9	5·7	4·3	11·7	8·9	17·7	13·4
58	11 29·5	11 31·4	10 58·1	5·8	4·4	11·8	8·9	17·8	13·5
59	11 29·8	11 31·6	10 58·3	5·9	4·5	11·9	9·0	17·9	13·6
60	11 30·0	11 31·9	10 58·6	6·0	4·6	12·0	9·1	18·0	13·7

^{m} 46	SUN PLANETS	ARIES	MOON	*v* or *d*	Corr^{n}	*v* or *d*	Corr^{n}	*v* or *d*	Corr^{n}
s	° ′	° ′	° ′	′	′	′	′	′	′
00	11 30·0	11 31·9	10 58·6	0·0	0·0	6·0	4·7	12·0	9·3
01	11 30·3	11 32·1	10 58·8	0·1	0·1	6·1	4·7	12·1	9·4
02	11 30·5	11 32·4	10 59·0	0·2	0·2	6·2	4·8	12·2	9·5
03	11 30·8	11 32·6	10 59·3	0·3	0·2	6·3	4·9	12·3	9·5
04	11 31·0	11 32·9	10 59·5	0·4	0·3	6·4	5·0	12·4	9·6
05	11 31·3	11 33·1	10 59·8	0·5	0·4	6·5	5·0	12·5	9·7
06	11 31·5	11 33·4	11 00·0	0·6	0·5	6·6	5·1	12·6	9·8
07	11 31·8	11 33·6	11 00·2	0·7	0·5	6·7	5·2	12·7	9·8
08	11 32·0	11 33·9	11 00·5	0·8	0·6	6·8	5·3	12·8	9·9
09	11 32·3	11 34·1	11 00·7	0·9	0·7	6·9	5·3	12·9	10·0
10	11 32·5	11 34·4	11 01·0	1·0	0·8	7·0	5·4	13·0	10·1
11	11 32·8	11 34·6	11 01·2	1·1	0·9	7·1	5·5	13·1	10·2
12	11 33·0	11 34·9	11 01·4	1·2	0·9	7·2	5·6	13·2	10·2
13	11 33·3	11 35·1	11 01·7	1·3	1·0	7·3	5·7	13·3	10·3
14	11 33·5	11 35·4	11 01·9	1·4	1·1	7·4	5·7	13·4	10·4
15	11 33·8	11 35·6	11 02·1	1·5	1·2	7·5	5·8	13·5	10·5
16	11 34·0	11 35·9	11 02·4	1·6	1·2	7·6	5·9	13·6	10·5
17	11 34·3	11 36·2	11 02·6	1·7	1·3	7·7	6·0	13·7	10·6
18	11 34·5	11 36·4	11 02·9	1·8	1·4	7·8	6·0	13·8	10·7
19	11 34·8	11 36·7	11 03·1	1·9	1·5	7·9	6·1	13·9	10·8
20	11 35·0	11 36·9	11 03·3	2·0	1·6	8·0	6·2	14·0	10·9
21	11 35·3	11 37·2	11 03·6	2·1	1·6	8·1	6·3	14·1	10·9
22	11 35·5	11 37·4	11 03·8	2·2	1·7	8·2	6·4	14·2	11·0
23	11 35·8	11 37·7	11 04·1	2·3	1·8	8·3	6·4	14·3	11·1
24	11 36·0	11 37·9	11 04·3	2·4	1·9	8·4	6·5	14·4	11·2
25	11 36·3	11 38·2	11 04·5	2·5	1·9	8·5	6·6	14·5	11·2
26	11 36·5	11 38·4	11 04·8	2·6	2·0	8·6	6·7	14·6	11·3
27	11 36·8	11 38·7	11 05·0	2·7	2·1	8·7	6·7	14·7	11·4
28	11 37·0	11 38·9	11 05·2	2·8	2·2	8·8	6·8	14·8	11·5
29	11 37·3	11 39·2	11 05·5	2·9	2·2	8·9	6·9	14·9	11·5
30	11 37·5	11 39·4	11 05·7	3·0	2·3	9·0	7·0	15·0	11·6
31	11 37·8	11 39·7	11 06·0	3·1	2·4	9·1	7·1	15·1	11·7
32	11 38·0	11 39·9	11 06·2	3·2	2·5	9·2	7·1	15·2	11·8
33	11 38·3	11 40·2	11 06·4	3·3	2·6	9·3	7·2	15·3	11·9
34	11 38·5	11 40·4	11 06·7	3·4	2·6	9·4	7·3	15·4	11·9
35	11 38·8	11 40·7	11 06·9	3·5	2·7	9·5	7·4	15·5	12·0
36	11 39·0	11 40·9	11 07·2	3·6	2·8	9·6	7·4	15·6	12·1
37	11 39·3	11 41·2	11 07·4	3·7	2·9	9·7	7·5	15·7	12·2
38	11 39·5	11 41·4	11 07·6	3·8	2·9	9·8	7·6	15·8	12·2
39	11 39·8	11 41·7	11 07·9	3·9	3·0	9·9	7·7	15·9	12·3
40	11 40·0	11 41·9	11 08·1	4·0	3·1	10·0	7·8	16·0	12·4
41	11 40·3	11 42·2	11 08·3	4·1	3·2	10·1	7·8	16·1	12·5
42	11 40·5	11 42·4	11 08·6	4·2	3·3	10·2	7·9	16·2	12·6
43	11 40·8	11 42·7	11 08·8	4·3	3·3	10·3	8·0	16·3	12·6
44	11 41·0	11 42·9	11 09·1	4·4	3·4	10·4	8·1	16·4	12·7
45	11 41·3	11 43·2	11 09·3	4·5	3·5	10·5	8·1	16·5	12·8
46	11 41·5	11 43·4	11 09·5	4·6	3·6	10·6	8·2	16·6	12·9
47	11 41·8	11 43·7	11 09·8	4·7	3·6	10·7	8·3	16·7	12·9
48	11 42·0	11 43·9	11 10·0	4·8	3·7	10·8	8·4	16·8	13·0
49	11 42·3	11 44·2	11 10·3	4·9	3·8	10·9	8·4	16·9	13·1
50	11 42·5	11 44·4	11 10·5	5·0	3·9	11·0	8·5	17·0	13·2
51	11 42·8	11 44·7	11 10·7	5·1	4·0	11·1	8·6	17·1	13·3
52	11 43·0	11 44·9	11 11·0	5·2	4·0	11·2	8·7	17·2	13·3
53	11 43·3	11 45·2	11 11·2	5·3	4·1	11·3	8·8	17·3	13·4
54	11 43·5	11 45·4	11 11·5	5·4	4·2	11·4	8·8	17·4	13·5
55	11 43·8	11 45·7	11 11·7	5·5	4·3	11·5	8·9	17·5	13·6
56	11 44·0	11 45·9	11 11·9	5·6	4·3	11·6	9·0	17·6	13·6
57	11 44·3	11 46·2	11 12·2	5·7	4·4	11·7	9·1	17·7	13·7
58	11 44·5	11 46·4	11 12·4	5·8	4·5	11·8	9·1	17·8	13·8
59	11 44·8	11 46·7	11 12·6	5·9	4·6	11·9	9·2	17·9	13·9
60	11 45·0	11 46·9	11 12·9	6·0	4·7	12·0	9·3	18·0	14·0

^{m} 47	SUN PLANETS	ARIES	MOON	*v* or *d*	Corr^{n}	*v* or *d*	Corr^{n}	*v* or *d*	Corr^{n}
s	° ′	° ′	° ′	′	′	′	′	′	′
00	11 45·0	11 46·9	11 12·9	0·0	0·0	6·0	4·8	12·0	9·5
01	11 45·3	11 47·2	11 13·1	0·1	0·1	6·1	4·8	12·1	9·6
02	11 45·5	11 47·4	11 13·4	0·2	0·2	6·2	4·9	12·2	9·7
03	11 45·8	11 47·7	11 13·6	0·3	0·2	6·3	5·0	12·3	9·7
04	11 46·0	11 47·9	11 13·8	0·4	0·3	6·4	5·1	12·4	9·8
05	11 46·3	11 48·2	11 14·1	0·5	0·4	6·5	5·1	12·5	9·9
06	11 46·5	11 48·4	11 14·3	0·6	0·5	6·6	5·2	12·6	10·0
07	11 46·8	11 48·7	11 14·6	0·7	0·6	6·7	5·3	12·7	10·1
08	11 47·0	11 48·9	11 14·8	0·8	0·6	6·8	5·4	12·8	10·1
09	11 47·3	11 49·2	11 15·0	0·9	0·7	6·9	5·5	12·9	10·2
10	11 47·5	11 49·4	11 15·3	1·0	0·8	7·0	5·5	13·0	10·3
11	11 47·8	11 49·7	11 15·5	1·1	0·9	7·1	5·6	13·1	10·4
12	11 48·0	11 49·9	11 15·7	1·2	1·0	7·2	5·7	13·2	10·5
13	11 48·3	11 50·2	11 16·0	1·3	1·0	7·3	5·8	13·3	10·5
14	11 48·5	11 50·4	11 16·2	1·4	1·1	7·4	5·9	13·4	10·6
15	11 48·8	11 50·7	11 16·5	1·5	1·2	7·5	5·9	13·5	10·7
16	11 49·0	11 50·9	11 16·7	1·6	1·3	7·6	6·0	13·6	10·8
17	11 49·3	11 51·2	11 16·9	1·7	1·3	7·7	6·1	13·7	10·8
18	11 49·5	11 51·4	11 17·2	1·8	1·4	7·8	6·2	13·8	10·9
19	11 49·8	11 51·7	11 17·4	1·9	1·5	7·9	6·3	13·9	11·0
20	11 50·0	11 51·9	11 17·7	2·0	1·6	8·0	6·3	14·0	11·1
21	11 50·3	11 52·2	11 17·9	2·1	1·7	8·1	6·4	14·1	11·2
22	11 50·5	11 52·4	11 18·1	2·2	1·7	8·2	6·5	14·2	11·2
23	11 50·8	11 52·7	11 18·4	2·3	1·8	8·3	6·6	14·3	11·3
24	11 51·0	11 52·9	11 18·6	2·4	1·9	8·4	6·7	14·4	11·4
25	11 51·3	11 53·2	11 18·8	2·5	2·0	8·5	6·7	14·5	11·5
26	11 51·5	11 53·4	11 19·1	2·6	2·1	8·6	6·8	14·6	11·6
27	11 51·8	11 53·7	11 19·3	2·7	2·1	8·7	6·9	14·7	11·6
28	11 52·0	11 53·9	11 19·6	2·8	2·2	8·8	7·0	14·8	11·7
29	11 52·3	11 54·2	11 19·8	2·9	2·3	8·9	7·0	14·9	11·8
30	11 52·5	11 54·5	11 20·0	3·0	2·4	9·0	7·1	15·0	11·9
31	11 52·8	11 54·7	11 20·3	3·1	2·5	9·1	7·2	15·1	12·0
32	11 53·0	11 55·0	11 20·5	3·2	2·5	9·2	7·3	15·2	12·0
33	11 53·3	11 55·2	11 20·8	3·3	2·6	9·3	7·4	15·3	12·1
34	11 53·5	11 55·5	11 21·0	3·4	2·7	9·4	7·4	15·4	12·2
35	11 53·8	11 55·7	11 21·2	3·5	2·8	9·5	7·5	15·5	12·3
36	11 54·0	11 56·0	11 21·5	3·6	2·9	9·6	7·6	15·6	12·4
37	11 54·3	11 56·2	11 21·7	3·7	2·9	9·7	7·7	15·7	12·4
38	11 54·5	11 56·5	11 22·0	3·8	3·0	9·8	7·8	15·8	12·5
39	11 54·8	11 56·7	11 22·2	3·9	3·1	9·9	7·8	15·9	12·6
40	11 55·0	11 57·0	11 22·4	4·0	3·2	10·0	7·9	16·0	12·7
41	11 55·3	11 57·2	11 22·7	4·1	3·2	10·1	8·0	16·1	12·7
42	11 55·5	11 57·5	11 22·9	4·2	3·3	10·2	8·1	16·2	12·8
43	11 55·8	11 57·7	11 23·1	4·3	3·4	10·3	8·2	16·3	12·9
44	11 56·0	11 58·0	11 23·4	4·4	3·5	10·4	8·2	16·4	13·0
45	11 56·3	11 58·2	11 23·6	4·5	3·6	10·5	8·3	16·5	13·1
46	11 56·5	11 58·5	11 23·9	4·6	3·6	10·6	8·4	16·6	13·1
47	11 56·8	11 58·7	11 24·1	4·7	3·7	10·7	8·5	16·7	13·2
48	11 57·0	11 59·0	11 24·3	4·8	3·8	10·8	8·6	16·8	13·3
49	11 57·3	11 59·2	11 24·6	4·9	3·9	10·9	8·6	16·9	13·4
50	11 57·5	11 59·5	11 24·8	5·0	4·0	11·0	8·7	17·0	13·5
51	11 57·8	11 59·7	11 25·1	5·1	4·0	11·1	8·8	17·1	13·5
52	11 58·0	12 00·0	11 25·3	5·2	4·1	11·2	8·9	17·2	13·6
53	11 58·3	12 00·2	11 25·5	5·3	4·2	11·3	8·9	17·3	13·7
54	11 58·5	12 00·5	11 25·8	5·4	4·3	11·4	9·0	17·4	13·8
55	11 58·8	12 00·7	11 26·0	5·5	4·4	11·5	9·1	17·5	13·9
56	11 59·0	12 01·0	11 26·2	5·6	4·4	11·6	9·2	17·6	13·9
57	11 59·3	12 01·2	11 26·5	5·7	4·5	11·7	9·3	17·7	14·0
58	11 59·5	12 01·5	11 26·7	5·8	4·6	11·8	9·3	17·8	14·1
59	11 59·8	12 01·7	11 27·0	5·9	4·7	11·9	9·4	17·9	14·2
60	12 00·0	12 02·0	11 27·2	6·0	4·8	12·0	9·5	18·0	14·3

48^{m}	SUN PLANETS	ARIES	MOON	*v* or *d*	Corr^{n}	*v* or *d*	Corr^{n}	*v* or *d*	Corr^{n}
s	° ′	° ′	° ′	′	′	′	′	′	′
00	12 00·0	12 02·0	11 27·2	0·0	0·0	6·0	4·9	12·0	9·7
01	12 00·3	12 02·2	11 27·4	0·1	0·1	6·1	4·9	12·1	9·8
02	12 00·5	12 02·5	11 27·7	0·2	0·2	6·2	5·0	12·2	9·9
03	12 00·8	12 02·7	11 27·9	0·3	0·2	6·3	5·1	12·3	9·9
04	12 01·0	12 03·0	11 28·2	0·4	0·3	6·4	5·2	12·4	10·0
05	12 01·3	12 03·2	11 28·4	0·5	0·4	6·5	5·3	12·5	10·1
06	12 01·5	12 03·5	11 28·6	0·6	0·5	6·6	5·3	12·6	10·2
07	12 01·8	12 03·7	11 28·9	0·7	0·6	6·7	5·4	12·7	10·3
08	12 02·0	12 04·0	11 29·1	0·8	0·6	6·8	5·5	12·8	10·3
09	12 02·3	12 04·2	11 29·3	0·9	0·7	6·9	5·6	12·9	10·4
10	12 02·5	12 04·5	11 29·6	1·0	0·8	7·0	5·7	13·0	10·5
11	12 02·8	12 04·7	11 29·8	1·1	0·9	7·1	5·7	13·1	10·6
12	12 03·0	12 05·0	11 30·1	1·2	1·0	7·2	5·8	13·2	10·7
13	12 03·3	12 05·2	11 30·3	1·3	1·1	7·3	5·9	13·3	10·8
14	12 03·5	12 05·5	11 30·5	1·4	1·1	7·4	6·0	13·4	10·8
15	12 03·8	12 05·7	11 30·8	1·5	1·2	7·5	6·1	13·5	10·9
16	12 04·0	12 06·0	11 31·0	1·6	1·3	7·6	6·1	13·6	11·0
17	12 04·3	12 06·2	11 31·3	1·7	1·4	7·7	6·2	13·7	11·1
18	12 04·5	12 06·5	11 31·5	1·8	1·5	7·8	6·3	13·8	11·2
19	12 04·8	12 06·7	11 31·7	1·9	1·5	7·9	6·4	13·9	11·2
20	12 05·0	12 07·0	11 32·0	2·0	1·6	8·0	6·5	14·0	11·3
21	12 05·3	12 07·2	11 32·2	2·1	1·7	8·1	6·5	14·1	11·4
22	12 05·5	12 07·5	11 32·4	2·2	1·8	8·2	6·6	14·2	11·5
23	12 05·8	12 07·7	11 32·7	2·3	1·9	8·3	6·7	14·3	11·6
24	12 06·0	12 08·0	11 32·9	2·4	1·9	8·4	6·8	14·4	11·6
25	12 06·3	12 08·2	11 33·2	2·5	2·0	8·5	6·9	14·5	11·7
26	12 06·5	12 08·5	11 33·4	2·6	2·1	8·6	7·0	14·6	11·8
27	12 06·8	12 08·7	11 33·6	2·7	2·2	8·7	7·0	14·7	11·9
28	12 07·0	12 09·0	11 33·9	2·8	2·3	8·8	7·1	14·8	12·0
29	12 07·3	12 09·2	11 34·1	2·9	2·3	8·9	7·2	14·9	12·0
30	12 07·5	12 09·5	11 34·4	3·0	2·4	9·0	7·3	15·0	12·1
31	12 07·8	12 09·7	11 34·6	3·1	2·5	9·1	7·4	15·1	12·2
32	12 08·0	12 10·0	11 34·8	3·2	2·6	9·2	7·4	15·2	12·3
33	12 08·3	12 10·2	11 35·1	3·3	2·7	9·3	7·5	15·3	12·4
34	12 08·5	12 10·5	11 35·3	3·4	2·7	9·4	7·6	15·4	12·4
35	12 08·8	12 10·7	11 35·6	3·5	2·8	9·5	7·7	15·5	12·5
36	12 09·0	12 11·0	11 35·8	3·6	2·9	9·6	7·8	15·6	12·6
37	12 09·3	12 11·2	11 36·0	3·7	3·0	9·7	7·8	15·7	12·7
38	12 09·5	12 11·5	11 36·3	3·8	3·1	9·8	7·9	15·8	12·8
39	12 09·8	12 11·7	11 36·5	3·9	3·2	9·9	8·0	15·9	12·9
40	12 10·0	12 12·0	11 36·7	4·0	3·2	10·0	8·1	16·0	12·9
41	12 10·3	12 12·2	11 37·0	4·1	3·3	10·1	8·2	16·1	13·0
42	12 10·5	12 12·5	11 37·2	4·2	3·4	10·2	8·2	16·2	13·1
43	12 10·8	12 12·8	11 37·5	4·3	3·5	10·3	8·3	16·3	13·2
44	12 11·0	12 13·0	11 37·7	4·4	3·6	10·4	8·4	16·4	13·3
45	12 11·3	12 13·3	11 37·9	4·5	3·6	10·5	8·5	16·5	13·3
46	12 11·5	12 13·5	11 38·2	4·6	3·7	10·6	8·6	16·6	13·4
47	12 11·8	12 13·8	11 38·4	4·7	3·8	10·7	8·6	16·7	13·5
48	12 12·0	12 14·0	11 38·7	4·8	3·9	10·8	8·7	16·8	13·6
49	12 12·3	12 14·3	11 38·9	4·9	4·0	10·9	8·8	16·9	13·7
50	12 12·5	12 14·5	11 39·1	5·0	4·0	11·0	8·9	17·0	13·7
51	12 12·8	12 14·8	11 39·4	5·1	4·1	11·1	9·0	17·1	13·8
52	12 13·0	12 15·0	11 39·6	5·2	4·2	11·2	9·1	17·2	13·9
53	12 13·3	12 15·3	11 39·8	5·3	4·3	11·3	9·1	17·3	14·0
54	12 13·5	12 15·5	11 40·1	5·4	4·4	11·4	9·2	17·4	14·1
55	12 13·8	12 15·8	11 40·3	5·5	4·4	11·5	9·3	17·5	14·1
56	12 14·0	12 16·0	11 40·6	5·6	4·5	11·6	9·4	17·6	14·2
57	12 14·3	12 16·3	11 40·8	5·7	4·6	11·7	9·5	17·7	14·3
58	12 14·5	12 16·5	11 41·0	5·8	4·7	11·8	9·5	17·8	14·4
59	12 14·8	12 16·8	11 41·3	5·9	4·8	11·9	9·6	17·9	14·5
60	12 15·0	12 17·0	11 41·5	6·0	4·9	12·0	9·7	18·0	14·6

49^{m}	SUN PLANETS	ARIES	MOON	*v* or *d*	Corr^{n}	*v* or *d*	Corr^{n}	*v* or *d*	Corr^{n}
s	° ′	° ′	° ′	′	′	′	′	′	′
00	12 15·0	12 17·0	11 41·5	0·0	0·0	6·0	5·0	12·0	9·9
01	12 15·3	12 17·3	11 41·8	0·1	0·1	6·1	5·0	12·1	10·0
02	12 15·5	12 17·5	11 42·0	0·2	0·2	6·2	5·1	12·2	10·1
03	12 15·8	12 17·8	11 42·2	0·3	0·2	6·3	5·2	12·3	10·1
04	12 16·0	12 18·0	11 42·5	0·4	0·3	6·4	5·3	12·4	10·2
05	12 16·3	12 18·3	11 42·7	0·5	0·4	6·5	5·4	12·5	10·3
06	12 16·5	12 18·5	11 42·9	0·6	0·5	6·6	5·4	12·6	10·4
07	12 16·8	12 18·8	11 43·2	0·7	0·6	6·7	5·5	12·7	10·5
08	12 17·0	12 19·0	11 43·4	0·8	0·7	6·8	5·6	12·8	10·6
09	12 17·3	12 19·3	11 43·7	0·9	0·7	6·9	5·7	12·9	10·6
10	12 17·5	12 19·5	11 43·9	1·0	0·8	7·0	5·8	13·0	10·7
11	12 17·8	12 19·8	11 44·1	1·1	0·9	7·1	5·9	13·1	10·8
12	12 18·0	12 20·0	11 44·4	1·2	1·0	7·2	5·9	13·2	10·9
13	12 18·3	12 20·3	11 44·6	1·3	1·1	7·3	6·0	13·3	11·0
14	12 18·5	12 20·5	11 44·9	1·4	1·2	7·4	6·1	13·4	11·1
15	12 18·8	12 20·8	11 45·1	1·5	1·2	7·5	6·2	13·5	11·1
16	12 19·0	12 21·0	11 45·3	1·6	1·3	7·6	6·3	13·6	11·2
17	12 19·3	12 21·3	11 45·6	1·7	1·4	7·7	6·4	13·7	11·3
18	12 19·5	12 21·5	11 45·8	1·8	1·5	7·8	6·4	13·8	11·4
19	12 19·8	12 21·8	11 46·1	1·9	1·6	7·9	6·5	13·9	11·5
20	12 20·0	12 22·0	11 46·3	2·0	1·7	8·0	6·6	14·0	11·6
21	12 20·3	12 22·3	11 46·5	2·1	1·7	8·1	6·7	14·1	11·6
22	12 20·5	12 22·5	11 46·8	2·2	1·8	8·2	6·8	14·2	11·7
23	12 20·8	12 22·8	11 47·0	2·3	1·9	8·3	6·8	14·3	11·8
24	12 21·0	12 23·0	11 47·2	2·4	2·0	8·4	6·9	14·4	11·9
25	12 21·3	12 23·3	11 47·5	2·5	2·1	8·5	7·0	14·5	12·0
26	12 21·5	12 23·5	11 47·7	2·6	2·1	8·6	7·1	14·6	12·0
27	12 21·8	12 23·8	11 48·0	2·7	2·2	8·7	7·2	14·7	12·1
28	12 22·0	12 24·0	11 48·2	2·8	2·3	8·8	7·3	14·8	12·2
29	12 22·3	12 24·3	11 48·4	2·9	2·4	8·9	7·3	14·9	12·3
30	12 22·5	12 24·5	11 48·7	3·0	2·5	9·0	7·4	15·0	12·4
31	12 22·8	12 24·8	11 48·9	3·1	2·6	9·1	7·5	15·1	12·5
32	12 23·0	12 25·0	11 49·2	3·2	2·6	9·2	7·6	15·2	12·5
33	12 23·3	12 25·3	11 49·4	3·3	2·7	9·3	7·7	15·3	12·6
34	12 23·5	12 25·5	11 49·6	3·4	2·8	9·4	7·8	15·4	12·7
35	12 23·8	12 25·8	11 49·9	3·5	2·9	9·5	7·8	15·5	12·8
36	12 24·0	12 26·0	11 50·1	3·6	3·0	9·6	7·9	15·6	12·9
37	12 24·3	12 26·3	11 50·3	3·7	3·1	9·7	8·0	15·7	13·0
38	12 24·5	12 26·5	11 50·6	3·8	3·1	9·8	8·1	15·8	13·0
39	12 24·8	12 26·8	11 50·8	3·9	3·2	9·9	8·2	15·9	13·1
40	12 25·0	12 27·0	11 51·1	4·0	3·3	10·0	8·3	16·0	13·2
41	12 25·3	12 27·3	11 51·3	4·1	3·4	10·1	8·3	16·1	13·3
42	12 25·5	12 27·5	11 51·5	4·2	3·5	10·2	8·4	16·2	13·4
43	12 25·8	12 27·8	11 51·8	4·3	3·5	10·3	8·5	16·3	13·4
44	12 26·0	12 28·0	11 52·0	4·4	3·6	10·4	8·6	16·4	13·5
45	12 26·3	12 28·3	11 52·3	4·5	3·7	10·5	8·7	16·5	13·6
46	12 26·5	12 28·5	11 52·5	4·6	3·8	10·6	8·7	16·6	13·7
47	12 26·8	12 28·8	11 52·7	4·7	3·9	10·7	8·8	16·7	13·8
48	12 27·0	12 29·0	11 53·0	4·8	4·0	10·8	8·9	16·8	13·9
49	12 27·3	12 29·3	11 53·2	4·9	4·0	10·9	9·0	16·9	13·9
50	12 27·5	12 29·5	11 53·4	5·0	4·1	11·0	9·1	17·0	14·0
51	12 27·8	12 29·8	11 53·7	5·1	4·2	11·1	9·2	17·1	14·1
52	12 28·0	12 30·0	11 53·9	5·2	4·3	11·2	9·2	17·2	14·2
53	12 28·3	12 30·3	11 54·2	5·3	4·4	11·3	9·3	17·3	14·3
54	12 28·5	12 30·5	11 54·4	5·4	4·5	11·4	9·4	17·4	14·4
55	12 28·8	12 30·8	11 54·6	5·5	4·5	11·5	9·5	17·5	14·4
56	12 29·0	12 31·1	11 54·9	5·6	4·6	11·6	9·6	17·6	14·5
57	12 29·3	12 31·3	11 55·1	5·7	4·7	11·7	9·7	17·7	14·6
58	12 29·5	12 31·6	11 55·4	5·8	4·8	11·8	9·7	17·8	14·7
59	12 29·8	12 31·8	11 55·6	5·9	4·9	11·9	9·8	17·9	14·8
60	12 30·0	12 32·1	11 55·8	6·0	5·0	12·0	9·9	18·0	14·9

50m	SUN PLANETS	ARIES	MOON	v or d	Corr^{n}	v or d	Corr^{n}	v or d	Corr^{n}
s	° ′	° ′	° ′	′	′	′	′	′	′
00	12 30·0	12 32·1	11 55·8	0·0	0·0	6·0	5·1	12·0	10·1
01	12 30·3	12 32·3	11 56·1	0·1	0·1	6·1	5·1	12·1	10·2
02	12 30·5	12 32·6	11 56·3	0·2	0·2	6·2	5·2	12·2	10·3
03	12 30·8	12 32·8	11 56·5	0·3	0·3	6·3	5·3	12·3	10·4
04	12 31·0	12 33·1	11 56·8	0·4	0·3	6·4	5·4	12·4	10·4
05	12 31·3	12 33·3	11 57·0	0·5	0·4	6·5	5·5	12·5	10·5
06	12 31·5	12 33·6	11 57·3	0·6	0·5	6·6	5·6	12·6	10·6
07	12 31·8	12 33·8	11 57·5	0·7	0·6	6·7	5·6	12·7	10·7
08	12 32·0	12 34·1	11 57·7	0·8	0·7	6·8	5·7	12·8	10·8
09	12 32·3	12 34·3	11 58·0	0·9	0·8	6·9	5·8	12·9	10·9
10	12 32·5	12 34·6	11 58·2	1·0	0·8	7·0	5·9	13·0	10·9
11	12 32·8	12 34·8	11 58·5	1·1	0·9	7·1	6·0	13·1	11·0
12	12 33·0	12 35·1	11 58·7	1·2	1·0	7·2	6·1	13·2	11·1
13	12 33·3	12 35·3	11 58·9	1·3	1·1	7·3	6·1	13·3	11·2
14	12 33·5	12 35·6	11 59·2	1·4	1·2	7·4	6·2	13·4	11·3
15	12 33·8	12 35·8	11 59·4	1·5	1·3	7·5	6·3	13·5	11·4
16	12 34·0	12 36·1	11 59·7	1·6	1·3	7·6	6·4	13·6	11·4
17	12 34·3	12 36·3	11 59·9	1·7	1·4	7·7	6·5	13·7	11·5
18	12 34·5	12 36·6	12 00·1	1·8	1·5	7·8	6·6	13·8	11·6
19	12 34·8	12 36·8	12 00·4	1·9	1·6	7·9	6·6	13·9	11·7
20	12 35·0	12 37·1	12 00·6	2·0	1·7	8·0	6·7	14·0	11·8
21	12 35·3	12 37·3	12 00·8	2·1	1·8	8·1	6·8	14·1	11·9
22	12 35·5	12 37·6	12 01·1	2·2	1·9	8·2	6·9	14·2	12·0
23	12 35·8	12 37·8	12 01·3	2·3	1·9	8·3	7·0	14·3	12·0
24	12 36·0	12 38·1	12 01·6	2·4	2·0	8·4	7·1	14·4	12·1
25	12 36·3	12 38·3	12 01·8	2·5	2·1	8·5	7·2	14·5	12·2
26	12 36·5	12 38·6	12 02·0	2·6	2·2	8·6	7·2	14·6	12·3
27	12 36·8	12 38·8	12 02·3	2·7	2·3	8·7	7·3	14·7	12·4
28	12 37·0	12 39·1	12 02·5	2·8	2·4	8·8	7·4	14·8	12·5
29	12 37·3	12 39·3	12 02·8	2·9	2·4	8·9	7·5	14·9	12·5
30	12 37·5	12 39·6	12 03·0	3·0	2·5	9·0	7·6	15·0	12·6
31	12 37·8	12 39·8	12 03·2	3·1	2·6	9·1	7·7	15·1	12·7
32	12 38·0	12 40·1	12 03·5	3·2	2·7	9·2	7·7	15·2	12·8
33	12 38·3	12 40·3	12 03·7	3·3	2·8	9·3	7·8	15·3	12·9
34	12 38·5	12 40·6	12 03·9	3·4	2·9	9·4	7·9	15·4	13·0
35	12 38·8	12 40·8	12 04·2	3·5	2·9	9·5	8·0	15·5	13·0
36	12 39·0	12 41·1	12 04·4	3·6	3·0	9·6	8·1	15·6	13·1
37	12 39·3	12 41·3	12 04·7	3·7	3·1	9·7	8·2	15·7	13·2
38	12 39·5	12 41·6	12 04·9	3·8	3·2	9·8	8·2	15·8	13·3
39	12 39·8	12 41·8	12 05·1	3·9	3·3	9·9	8·3	15·9	13·4
40	12 40·0	12 42·1	12 05·4	4·0	3·4	10·0	8·4	16·0	13·5
41	12 40·3	12 42·3	12 05·6	4·1	3·5	10·1	8·5	16·1	13·6
42	12 40·5	12 42·6	12 05·9	4·2	3·5	10·2	8·6	16·2	13·6
43	12 40·8	12 42·8	12 06·1	4·3	3·6	10·3	8·7	16·3	13·7
44	12 41·0	12 43·1	12 06·3	4·4	3·7	10·4	8·8	16·4	13·8
45	12 41·3	12 43·3	12 06·6	4·5	3·8	10·5	8·8	16·5	13·9
46	12 41·5	12 43·6	12 06·8	4·6	3·9	10·6	8·9	16·6	14·0
47	12 41·8	12 43·8	12 07·0	4·7	4·0	10·7	9·0	16·7	14·1
48	12 42·0	12 44·1	12 07·3	4·8	4·0	10·8	9·1	16·8	14·1
49	12 42·3	12 44·3	12 07·5	4·9	4·1	10·9	9·2	16·9	14·2
50	12 42·5	12 44·6	12 07·8	5·0	4·2	11·0	9·3	17·0	14·3
51	12 42·8	12 44·8	12 08·0	5·1	4·3	11·1	9·3	17·1	14·4
52	12 43·0	12 45·1	12 08·2	5·2	4·4	11·2	9·4	17·2	14·5
53	12 43·3	12 45·3	12 08·5	5·3	4·5	11·3	9·5	17·3	14·6
54	12 43·5	12 45·6	12 08·7	5·4	4·5	11·4	9·6	17·4	14·6
55	12 43·8	12 45·8	12 09·0	5·5	4·6	11·5	9·7	17·5	14·7
56	12 44·0	12 46·1	12 09·2	5·6	4·7	11·6	9·8	17·6	14·8
57	12 44·3	12 46·3	12 09·4	5·7	4·8	11·7	9·8	17·7	14·9
58	12 44·5	12 46·6	12 09·7	5·8	4·9	11·8	9·9	17·8	15·0
59	12 44·8	12 46·8	12 09·9	5·9	5·0	11·9	10·0	17·9	15·1
60	12 45·0	12 47·1	12 10·2	6·0	5·1	12·0	10·1	18·0	15·2

51m	SUN PLANETS	ARIES	MOON	v or d	Corr^{n}	v or d	Corr^{n}	v or d	Corr^{n}
s	° ′	° ′	° ′	′	′	′	′	′	′
00	12 45·0	12 47·1	12 10·2	0·0	0·0	6·0	5·2	12·0	10·3
01	12 45·3	12 47·3	12 10·4	0·1	0·1	6·1	5·2	12·1	10·4
02	12 45·5	12 47·6	12 10·6	0·2	0·2	6·2	5·3	12·2	10·5
03	12 45·8	12 47·8	12 10·9	0·3	0·3	6·3	5·4	12·3	10·6
04	12 46·0	12 48·1	12 11·1	0·4	0·3	6·4	5·5	12·4	10·6
05	12 46·3	12 48·3	12 11·3	0·5	0·4	6·5	5·6	12·5	10·7
06	12 46·5	12 48·6	12 11·6	0·6	0·5	6·6	5·7	12·6	10·8
07	12 46·8	12 48·8	12 11·8	0·7	0·6	6·7	5·8	12·7	10·9
08	12 47·0	12 49·1	12 12·1	0·8	0·7	6·8	5·8	12·8	11·0
09	12 47·3	12 49·4	12 12·3	0·9	0·8	6·9	5·9	12·9	11·1
10	12 47·5	12 49·6	12 12·5	1·0	0·9	7·0	6·0	13·0	11·2
11	12 47·8	12 49·9	12 12·8	1·1	0·9	7·1	6·1	13·1	11·2
12	12 48·0	12 50·1	12 13·0	1·2	1·0	7·2	6·2	13·2	11·3
13	12 48·3	12 50·4	12 13·3	1·3	1·1	7·3	6·3	13·3	11·4
14	12 48·5	12 50·6	12 13·5	1·4	1·2	7·4	6·4	13·4	11·5
15	12 48·8	12 50·9	12 13·7	1·5	1·3	7·5	6·4	13·5	11·6
16	12 49·0	12 51·1	12 14·0	1·6	1·4	7·6	6·5	13·6	11·7
17	12 49·3	12 51·4	12 14·2	1·7	1·5	7·7	6·6	13·7	11·8
18	12 49·5	12 51·6	12 14·4	1·8	1·5	7·8	6·7	13·8	11·8
19	12 49·8	12 51·9	12 14·7	1·9	1·6	7·9	6·8	13·9	11·9
20	12 50·0	12 52·1	12 14·9	2·0	1·7	8·0	6·9	14·0	12·0
21	12 50·3	12 52·4	12 15·2	2·1	1·8	8·1	7·0	14·1	12·1
22	12 50·5	12 52·6	12 15·4	2·2	1·9	8·2	7·0	14·2	12·2
23	12 50·8	12 52·9	12 15·6	2·3	2·0	8·3	7·1	14·3	12·3
24	12 51·0	12 53·1	12 15·9	2·4	2·1	8·4	7·2	14·4	12·4
25	12 51·3	12 53·4	12 16·1	2·5	2·1	8·5	7·3	14·5	12·4
26	12 51·5	12 53·6	12 16·4	2·6	2·2	8·6	7·4	14·6	12·5
27	12 51·8	12 53·9	12 16·6	2·7	2·3	8·7	7·5	14·7	12·6
28	12 52·0	12 54·1	12 16·8	2·8	2·4	8·8	7·6	14·8	12·7
29	12 52·3	12 54·4	12 17·1	2·9	2·5	8·9	7·6	14·9	12·8
30	12 52·5	12 54·6	12 17·3	3·0	2·6	9·0	7·7	15·0	12·9
31	12 52·8	12 54·9	12 17·5	3·1	2·7	9·1	7·8	15·1	13·0
32	12 53·0	12 55·1	12 17·8	3·2	2·7	9·2	7·9	15·2	13·0
33	12 53·3	12 55·4	12 18·0	3·3	2·8	9·3	8·0	15·3	13·1
34	12 53·5	12 55·6	12 18·3	3·4	2·9	9·4	8·1	15·4	13·2
35	12 53·8	12 55·9	12 18·5	3·5	3·0	9·5	8·2	15·5	13·3
36	12 54·0	12 56·1	12 18·7	3·6	3·1	9·6	8·2	15·6	13·4
37	12 54·3	12 56·4	12 19·0	3·7	3·2	9·7	8·3	15·7	13·5
38	12 54·5	12 56·6	12 19·2	3·8	3·3	9·8	8·4	15·8	13·6
39	12 54·8	12 56·9	12 19·5	3·9	3·3	9·9	8·5	15·9	13·6
40	12 55·0	12 57·1	12 19·7	4·0	3·4	10·0	8·6	16·0	13·7
41	12 55·3	12 57·4	12 19·9	4·1	3·5	10·1	8·7	16·1	13·8
42	12 55·5	12 57·6	12 20·2	4·2	3·6	10·2	8·8	16·2	13·9
43	12 55·8	12 57·9	12 20·4	4·3	3·7	10·3	8·8	16·3	14·0
44	12 56·0	12 58·1	12 20·6	4·4	3·8	10·4	8·9	16·4	14·1
45	12 56·3	12 58·4	12 20·9	4·5	3·9	10·5	9·0	16·5	14·2
46	12 56·5	12 58·6	12 21·1	4·6	3·9	10·6	9·1	16·6	14·2
47	12 56·8	12 58·9	12 21·4	4·7	4·0	10·7	9·2	16·7	14·3
48	12 57·0	12 59·1	12 21·6	4·8	4·1	10·8	9·3	16·8	14·4
49	12 57·3	12 59·4	12 21·8	4·9	4·2	10·9	9·4	16·9	14·5
50	12 57·5	12 59·6	12 22·1	5·0	4·3	11·0	9·4	17·0	14·6
51	12 57·8	12 59·9	12 22·3	5·1	4·4	11·1	9·5	17·1	14·7
52	12 58·0	13 00·1	12 22·6	5·2	4·5	11·2	9·6	17·2	14·8
53	12 58·3	13 00·4	12 22·8	5·3	4·5	11·3	9·7	17·3	14·8
54	12 58·5	13 00·6	12 23·0	5·4	4·6	11·4	9·8	17·4	14·9
55	12 58·8	13 00·9	12 23·3	5·5	4·7	11·5	9·9	17·5	15·0
56	12 59·0	13 01·1	12 23·5	5·6	4·8	11·6	10·0	17·6	15·1
57	12 59·3	13 01·4	12 23·8	5·7	4·9	11·7	10·0	17·7	15·2
58	12 59·5	13 01·6	12 24·0	5·8	5·0	11·8	10·1	17·8	15·3
59	12 59·8	13 01·9	12 24·2	5·9	5·1	11·9	10·2	17·9	15·4
60	13 00·0	13 02·1	12 24·5	6·0	5·2	12·0	10·3	18·0	15·5

INCREMENTS AND CORRECTIONS

52^{m}	SUN PLANETS	ARIES	MOON	v or d	Corr^{n}	v or d	Corr^{n}	v or d	Corr^{n}
s	° ′	° ′	° ′	′	′	′	′	′	′
00	13 00·0	13 02·1	12 24·5	0·0	0·0	6·0	5·3	12·0	10·5
01	13 00·3	13 02·4	12 24·7	0·1	0·1	6·1	5·3	12·1	10·6
02	13 00·5	13 02·6	12 24·9	0·2	0·2	6·2	5·4	12·2	10·7
03	13 00·8	13 02·9	12 25·2	0·3	0·3	6·3	5·5	12·3	10·8
04	13 01·0	13 03·1	12 25·4	0·4	0·4	6·4	5·6	12·4	10·9
05	13 01·3	13 03·4	12 25·7	0·5	0·4	6·5	5·7	12·5	10·9
06	13 01·5	13 03·6	12 25·9	0·6	0·5	6·6	5·8	12·6	11·0
07	13 01·8	13 03·9	12 26·1	0·7	0·6	6·7	5·9	12·7	11·1
08	13 02·0	13 04·1	12 26·4	0·8	0·7	6·8	6·0	12·8	11·2
09	13 02·3	13 04·4	12 26·6	0·9	0·8	6·9	6·0	12·9	11·3
10	13 02·5	13 04·6	12 26·9	1·0	0·9	7·0	6·1	13·0	11·4
11	13 02·8	13 04·9	12 27·1	1·1	1·0	7·1	6·2	13·1	11·5
12	13 03·0	13 05·1	12 27·3	1·2	1·1	7·2	6·3	13·2	11·6
13	13 03·3	13 05·4	12 27·6	1·3	1·1	7·3	6·4	13·3	11·6
14	13 03·5	13 05·6	12 27·8	1·4	1·2	7·4	6·5	13·4	11·7
15	13 03·8	13 05·9	12 28·0	1·5	1·3	7·5	6·6	13·5	11·8
16	13 04·0	13 06·1	12 28·3	1·6	1·4	7·6	6·7	13·6	11·9
17	13 04·3	13 06·4	12 28·5	1·7	1·5	7·7	6·7	13·7	12·0
18	13 04·5	13 06·6	12 28·8	1·8	1·6	7·8	6·8	13·8	12·1
19	13 04·8	13 06·9	12 29·0	1·9	1·7	7·9	6·9	13·9	12·2
20	13 05·0	13 07·1	12 29·2	2·0	1·8	8·0	7·0	14·0	12·3
21	13 05·3	13 07·4	12 29·5	2·1	1·8	8·1	7·1	14·1	12·3
22	13 05·5	13 07·7	12 29·7	2·2	1·9	8·2	7·2	14·2	12·4
23	13 05·8	13 07·9	12 30·0	2·3	2·0	8·3	7·3	14·3	12·5
24	13 06·0	13 08·2	12 30·2	2·4	2·1	8·4	7·4	14·4	12·6
25	13 06·3	13 08·4	12 30·4	2·5	2·2	8·5	7·4	14·5	12·7
26	13 06·5	13 08·7	12 30·7	2·6	2·3	8·6	7·5	14·6	12·8
27	13 06·8	13 08·9	12 30·9	2·7	2·4	8·7	7·6	14·7	12·9
28	13 07·0	13 09·2	12 31·1	2·8	2·5	8·8	7·7	14·8	13·0
29	13 07·3	13 09·4	12 31·4	2·9	2·5	8·9	7·8	14·9	13·0
30	13 07·5	13 09·7	12 31·6	3·0	2·6	9·0	7·9	15·0	13·1
31	13 07·8	13 09·9	12 31·9	3·1	2·7	9·1	8·0	15·1	13·2
32	13 08·0	13 10·2	12 32·1	3·2	2·8	9·2	8·1	15·2	13·3
33	13 08·3	13 10·4	12 32·3	3·3	2·9	9·3	8·1	15·3	13·4
34	13 08·5	13 10·7	12 32·6	3·4	3·0	9·4	8·2	15·4	13·5
35	13 08·8	13 10·9	12 32·8	3·5	3·1	9·5	8·3	15·5	13·6
36	13 09·0	13 11·2	12 33·1	3·6	3·2	9·6	8·4	15·6	13·7
37	13 09·3	13 11·4	12 33·3	3·7	3·2	9·7	8·5	15·7	13·7
38	13 09·5	13 11·7	12 33·5	3·8	3·3	9·8	8·6	15·8	13·8
39	13 09·8	13 11·9	12 33·8	3·9	3·4	9·9	8·7	15·9	13·9
40	13 10·0	13 12·2	12 34·0	4·0	3·5	10·0	8·8	16·0	14·0
41	13 10·3	13 12·4	12 34·2	4·1	3·6	10·1	8·8	16·1	14·1
42	13 10·5	13 12·7	12 34·5	4·2	3·7	10·2	8·9	16·2	14·2
43	13 10·8	13 12·9	12 34·7	4·3	3·8	10·3	9·0	16·3	14·3
44	13 11·0	13 13·2	12 35·0	4·4	3·9	10·4	9·1	16·4	14·4
45	13 11·3	13 13·4	12 35·2	4·5	3·9	10·5	9·2	16·5	14·4
46	13 11·5	13 13·7	12 35·4	4·6	4·0	10·6	9·3	16·6	14·5
47	13 11·8	13 13·9	12 35·7	4·7	4·1	10·7	9·4	16·7	14·6
48	13 12·0	13 14·2	12 35·9	4·8	4·2	10·8	9·5	16·8	14·7
49	13 12·3	13 14·4	12 36·2	4·9	4·3	10·9	9·5	16·9	14·8
50	13 12·5	13 14·7	12 36·4	5·0	4·4	11·0	9·6	17·0	14·9
51	13 12·8	13 14·9	12 36·6	5·1	4·5	11·1	9·7	17·1	15·0
52	13 13·0	13 15·2	12 36·9	5·2	4·6	11·2	9·8	17·2	15·1
53	13 13·3	13 15·4	12 37·1	5·3	4·6	11·3	9·9	17·3	15·1
54	13 13·5	13 15·7	12 37·4	5·4	4·7	11·4	10·0	17·4	15·2
55	13 13·8	13 15·9	12 37·6	5·5	4·8	11·5	10·1	17·5	15·3
56	13 14·0	13 16·2	12 37·8	5·6	4·9	11·6	10·2	17·6	15·4
57	13 14·3	13 16·4	12 38·1	5·7	5·0	11·7	10·2	17·7	15·5
58	13 14·5	13 16·7	12 38·3	5·8	5·1	11·8	10·3	17·8	15·6
59	13 14·8	13 16·9	12 38·5	5·9	5·2	11·9	10·4	17·9	15·7
60	13 15·0	13 17·2	12 38·8	6·0	5·3	12·0	10·5	18·0	15·8

53^{m}	SUN PLANETS	ARIES	MOON	v or d	Corr^{n}	v or d	Corr^{n}	v or d	Corr^{n}
s	° ′	° ′	° ′	′	′	′	′	′	′
00	13 15·0	13 17·2	12 38·8	0·0	0·0	6·0	5·4	12·0	10·7
01	13 15·3	13 17·4	12 39·0	0·1	0·1	6·1	5·4	12·1	10·8
02	13 15·5	13 17·7	12 39·3	0·2	0·2	6·2	5·5	12·2	10·9
03	13 15·8	13 17·9	12 39·5	0·3	0·3	6·3	5·6	12·3	11·0
04	13 16·0	13 18·2	12 39·7	0·4	0·4	6·4	5·7	12·4	11·1
05	13 16·3	13 18·4	12 40·0	0·5	0·4	6·5	5·8	12·5	11·1
06	13 16·5	13 18·7	12 40·2	0·6	0·5	6·6	5·9	12·6	11·2
07	13 16·8	13 18·9	12 40·5	0·7	0·6	6·7	6·0	12·7	11·3
08	13 17·0	13 19·2	12 40·7	0·8	0·7	6·8	6·1	12·8	11·4
09	13 17·3	13 19·4	12 40·9	0·9	0·8	6·9	6·2	12·9	11·5
10	13 17·5	13 19·7	12 41·2	1·0	0·9	7·0	6·2	13·0	11·6
11	13 17·8	13 19·9	12 41·4	1·1	1·0	7·1	6·3	13·1	11·7
12	13 18·0	13 20·2	12 41·6	1·2	1·1	7·2	6·4	13·2	11·8
13	13 18·3	13 20·4	12 41·9	1·3	1·2	7·3	6·5	13·3	11·9
14	13 18·5	13 20·7	12 42·1	1·4	1·2	7·4	6·6	13·4	11·9
15	13 18·8	13 20·9	12 42·4	1·5	1·3	7·5	6·7	13·5	12·0
16	13 19·0	13 21·2	12 42·6	1·6	1·4	7·6	6·8	13·6	12·1
17	13 19·3	13 21·4	12 42·8	1·7	1·5	7·7	6·9	13·7	12·2
18	13 19·5	13 21·7	12 43·1	1·8	1·6	7·8	7·0	13·8	12·3
19	13 19·8	13 21·9	12 43·3	1·9	1·7	7·9	7·0	13·9	12·4
20	13 20·0	13 22·2	12 43·6	2·0	1·8	8·0	7·1	14·0	12·5
21	13 20·3	13 22·4	12 43·8	2·1	1·9	8·1	7·2	14·1	12·6
22	13 20·5	13 22·7	12 44·0	2·2	2·0	8·2	7·3	14·2	12·7
23	13 20·8	13 22·9	12 44·3	2·3	2·1	8·3	7·4	14·3	12·8
24	13 21·0	13 23·2	12 44·5	2·4	2·1	8·4	7·5	14·4	12·8
25	13 21·3	13 23·4	12 44·7	2·5	2·2	8·5	7·6	14·5	12·9
26	13 21·5	13 23·7	12 45·0	2·6	2·3	8·6	7·7	14·6	13·0
27	13 21·8	13 23·9	12 45·2	2·7	2·4	8·7	7·8	14·7	13·1
28	13 22·0	13 24·2	12 45·5	2·8	2·5	8·8	7·8	14·8	13·2
29	13 22·3	13 24·4	12 45·7	2·9	2·6	8·9	7·9	14·9	13·3
30	13 22·5	13 24·7	12 45·9	3·0	2·7	9·0	8·0	15·0	13·4
31	13 22·8	13 24·9	12 46·2	3·1	2·8	9·1	8·1	15·1	13·5
32	13 23·0	13 25·2	12 46·4	3·2	2·9	9·2	8·2	15·2	13·6
33	13 23·3	13 25·4	12 46·7	3·3	2·9	9·3	8·3	15·3	13·6
34	13 23·5	13 25·7	12 46·9	3·4	3·0	9·4	8·4	15·4	13·7
35	13 23·8	13 26·0	12 47·1	3·5	3·1	9·5	8·5	15·5	13·8
36	13 24·0	13 26·2	12 47·4	3·6	3·2	9·6	8·6	15·6	13·9
37	13 24·3	13 26·5	12 47·6	3·7	3·3	9·7	8·6	15·7	14·0
38	13 24·5	13 26·7	12 47·9	3·8	3·4	9·8	8·7	15·8	14·1
39	13 24·8	13 27·0	12 48·1	3·9	3·5	9·9	8·8	15·9	14·2
40	13 25·0	13 27·2	12 48·3	4·0	3·6	10·0	8·9	16·0	14·3
41	13 25·3	13 27·5	12 48·6	4·1	3·7	10·1	9·0	16·1	14·4
42	13 25·5	13 27·7	12 48·8	4·2	3·7	10·2	9·1	16·2	14·4
43	13 25·8	13 28·0	12 49·0	4·3	3·8	10·3	9·2	16·3	14·5
44	13 26·0	13 28·2	12 49·3	4·4	3·9	10·4	9·3	16·4	14·6
45	13 26·3	13 28·5	12 49·5	4·5	4·0	10·5	9·4	16·5	14·7
46	13 26·5	13 28·7	12 49·8	4·6	4·1	10·6	9·5	16·6	14·8
47	13 26·8	13 29·0	12 50·0	4·7	4·2	10·7	9·5	16·7	14·9
48	13 27·0	13 29·2	12 50·2	4·8	4·3	10·8	9·6	16·8	15·0
49	13 27·3	13 29·5	12 50·5	4·9	4·4	10·9	9·7	16·9	15·1
50	13 27·5	13 29·7	12 50·7	5·0	4·5	11·0	9·8	17·0	15·2
51	13 27·8	13 30·0	12 51·0	5·1	4·5	11·1	9·9	17·1	15·2
52	13 28·0	13 30·2	12 51·2	5·2	4·6	11·2	10·0	17·2	15·3
53	13 28·3	13 30·5	12 51·4	5·3	4·7	11·3	10·1	17·3	15·4
54	13 28·5	13 30·7	12 51·7	5·4	4·8	11·4	10·2	17·4	15·5
55	13 28·8	13 31·0	12 51·9	5·5	4·9	11·5	10·3	17·5	15·6
56	13 29·0	13 31·2	12 52·1	5·6	5·0	11·6	10·3	17·6	15·7
57	13 29·3	13 31·5	12 52·4	5·7	5·1	11·7	10·4	17·7	15·8
58	13 29·5	13 31·7	12 52·6	5·8	5·2	11·8	10·5	17·8	15·9
59	13 29·8	13 32·0	12 52·9	5·9	5·3	11·9	10·6	17·9	16·0
60	13 30·0	13 32·2	12 53·1	6·0	5·4	12·0	10·7	18·0	16·1

54^{m}	SUN PLANETS	ARIES	MOON	v or d	Corr^{n}	v or d	Corr^{n}	v or d	Corr^{n}
s	° ′	° ′	° ′	′	′	′	′	′	′
00	13 30·0	13 32·2	12 53·1	0·0	0·0	6·0	5·5	12·0	10·9
01	13 30·3	13 32·5	12 53·3	0·1	0·1	6·1	5·5	12·1	11·0
02	13 30·5	13 32·7	12 53·6	0·2	0·2	6·2	5·6	12·2	11·1
03	13 30·8	13 33·0	12 53·8	0·3	0·3	6·3	5·7	12·3	11·2
04	13 31·0	13 33·2	12 54·1	0·4	0·4	6·4	5·8	12·4	11·3
05	13 31·3	13 33·5	12 54·3	0·5	0·5	6·5	5·9	12·5	11·4
06	13 31·5	13 33·7	12 54·5	0·6	0·5	6·6	6·0	12·6	11·4
07	13 31·8	13 34·0	12 54·8	0·7	0·6	6·7	6·1	12·7	11·5
08	13 32·0	13 34·2	12 55·0	0·8	0·7	6·8	6·2	12·8	11·6
09	13 32·3	13 34·5	12 55·2	0·9	0·8	6·9	6·3	12·9	11·7
10	13 32·5	13 34·7	12 55·5	1·0	0·9	7·0	6·4	13·0	11·8
11	13 32·8	13 35·0	12 55·7	1·1	1·0	7·1	6·4	13·1	11·9
12	13 33·0	13 35·2	12 56·0	1·2	1·1	7·2	6·5	13·2	12·0
13	13 33·3	13 35·5	12 56·2	1·3	1·2	7·3	6·6	13·3	12·1
14	13 33·5	13 35·7	12 56·4	1·4	1·3	7·4	6·7	13·4	12·2
15	13 33·8	13 36·0	12 56·7	1·5	1·4	7·5	6·8	13·5	12·3
16	13 34·0	13 36·2	12 56·9	1·6	1·5	7·6	6·9	13·6	12·4
17	13 34·3	13 36·5	12 57·2	1·7	1·5	7·7	7·0	13·7	12·4
18	13 34·5	13 36·7	12 57·4	1·8	1·6	7·8	7·1	13·8	12·5
19	13 34·8	13 37·0	12 57·6	1·9	1·7	7·9	7·2	13·9	12·6
20	13 35·0	13 37·2	12 57·9	2·0	1·8	8·0	7·3	14·0	12·7
21	13 35·3	13 37·5	12 58·1	2·1	1·9	8·1	7·4	14·1	12·8
22	13 35·5	13 37·7	12 58·3	2·2	2·0	8·2	7·4	14·2	12·9
23	13 35·8	13 38·0	12 58·6	2·3	2·1	8·3	7·5	14·3	13·0
24	13 36·0	13 38·2	12 58·8	2·4	2·2	8·4	7·6	14·4	13·1
25	13 36·3	13 38·5	12 59·1	2·5	2·3	8·5	7·7	14·5	13·2
26	13 36·5	13 38·7	12 59·3	2·6	2·4	8·6	7·8	14·6	13·3
27	13 36·8	13 39·0	12 59·5	2·7	2·5	8·7	7·9	14·7	13·4
28	13 37·0	13 39·2	12 59·8	2·8	2·5	8·8	8·0	14·8	13·4
29	13 37·3	13 39·5	13 00·0	2·9	2·6	8·9	8·1	14·9	13·5
30	13 37·5	13 39·7	13 00·3	3·0	2·7	9·0	8·2	15·0	13·6
31	13 37·8	13 40·0	13 00·5	3·1	2·8	9·1	8·3	15·1	13·7
32	13 38·0	13 40·2	13 00·7	3·2	2·9	9·2	8·4	15·2	13·8
33	13 38·3	13 40·5	13 01·0	3·3	3·0	9·3	8·4	15·3	13·9
34	13 38·5	13 40·7	13 01·2	3·4	3·1	9·4	8·5	15·4	14·0
35	13 38·8	13 41·0	13 01·5	3·5	3·2	9·5	8·6	15·5	14·1
36	13 39·0	13 41·2	13 01·7	3·6	3·3	9·6	8·7	15·6	14·2
37	13 39·3	13 41·5	13 01·9	3·7	3·4	9·7	8·8	15·7	14·3
38	13 39·5	13 41·7	13 02·2	3·8	3·5	9·8	8·9	15·8	14·4
39	13 39·8	13 42·0	13 02·4	3·9	3·5	9·9	9·0	15·9	14·4
40	13 40·0	13 42·2	13 02·6	4·0	3·6	10·0	9·1	16·0	14·5
41	13 40·3	13 42·5	13 02·9	4·1	3·7	10·1	9·2	16·1	14·6
42	13 40·5	13 42·7	13 03·1	4·2	3·8	10·2	9·3	16·2	14·7
43	13 40·8	13 43·0	13 03·4	4·3	3·9	10·3	9·4	16·3	14·8
44	13 41·0	13 43·2	13 03·6	4·4	4·0	10·4	9·4	16·4	14·9
45	13 41·3	13 43·5	13 03·8	4·5	4·1	10·5	9·5	16·5	15·0
46	13 41·5	13 43·7	13 04·1	4·6	4·2	10·6	9·6	16·6	15·1
47	13 41·8	13 44·0	13 04·3	4·7	4·3	10·7	9·7	16·7	15·2
48	13 42·0	13 44·3	13 04·6	4·8	4·4	10·8	9·8	16·8	15·3
49	13 42·3	13 44·5	13 04·8	4·9	4·5	10·9	9·9	16·9	15·4
50	13 42·5	13 44·8	13 05·0	5·0	4·5	11·0	10·0	17·0	15·4
51	13 42·8	13 45·0	13 05·3	5·1	4·6	11·1	10·1	17·1	15·5
52	13 43·0	13 45·3	13 05·5	5·2	4·7	11·2	10·2	17·2	15·6
53	13 43·3	13 45·5	13 05·7	5·3	4·8	11·3	10·3	17·3	15·7
54	13 43·5	13 45·8	13 06·0	5·4	4·9	11·4	10·4	17·4	15·8
55	13 43·8	13 46·0	13 06·2	5·5	5·0	11·5	10·4	17·5	15·9
56	13 44·0	13 46·3	13 06·5	5·6	5·1	11·6	10·5	17·6	16·0
57	13 44·3	13 46·5	13 06·7	5·7	5·2	11·7	10·6	17·7	16·1
58	13 44·5	13 46·8	13 06·9	5·8	5·3	11·8	10·7	17·8	16·2
59	13 44·8	13 47·0	13 07·2	5·9	5·4	11·9	10·8	17·9	16·3
60	13 45·0	13 47·3	13 07·4	6·0	5·5	12·0	10·9	18·0	16·4

55^{m}	SUN PLANETS	ARIES	MOON	v or d	Corr^{n}	v or d	Corr^{n}	v or d	Corr^{n}
s	° ′	° ′	° ′	′	′	′	′	′	′
00	13 45·0	13 47·3	13 07·4	0·0	0·0	6·0	5·6	12·0	11·1
01	13 45·3	13 47·5	13 07·7	0·1	0·1	6·1	5·6	12·1	11·2
02	13 45·5	13 47·8	13 07·9	0·2	0·2	6·2	5·7	12·2	11·3
03	13 45·8	13 48·0	13 08·1	0·3	0·3	6·3	5·8	12·3	11·4
04	13 46·0	13 48·3	13 08·4	0·4	0·4	6·4	5·9	12·4	11·5
05	13 46·3	13 48·5	13 08·6	0·5	0·5	6·5	6·0	12·5	11·6
06	13 46·5	13 48·8	13 08·8	0·6	0·6	6·6	6·1	12·6	11·7
07	13 46·8	13 49·0	13 09·1	0·7	0·6	6·7	6·2	12·7	11·7
08	13 47·0	13 49·3	13 09·3	0·8	0·7	6·8	6·3	12·8	11·8
09	13 47·3	13 49·5	13 09·6	0·9	0·8	6·9	6·4	12·9	11·9
10	13 47·5	13 49·8	13 09·8	1·0	0·9	7·0	6·5	13·0	12·0
11	13 47·8	13 50·0	13 10·0	1·1	1·0	7·1	6·6	13·1	12·1
12	13 48·0	13 50·3	13 10·3	1·2	1·1	7·2	6·7	13·2	12·2
13	13 48·3	13 50·5	13 10·5	1·3	1·2	7·3	6·8	13·3	12·3
14	13 48·5	13 50·8	13 10·8	1·4	1·3	7·4	6·8	13·4	12·4
15	13 48·8	13 51·0	13 11·0	1·5	1·4	7·5	6·9	13·5	12·5
16	13 49·0	13 51·3	13 11·2	1·6	1·5	7·6	7·0	13·6	12·6
17	13 49·3	13 51·5	13 11·5	1·7	1·6	7·7	7·1	13·7	12·7
18	13 49·5	13 51·8	13 11·7	1·8	1·7	7·8	7·2	13·8	12·8
19	13 49·8	13 52·0	13 12·0	1·9	1·8	7·9	7·3	13·9	12·9
20	13 50·0	13 52·3	13 12·2	2·0	1·9	8·0	7·4	14·0	13·0
21	13 50·3	13 52·5	13 12·4	2·1	1·9	8·1	7·5	14·1	13·0
22	13 50·5	13 52·8	13 12·7	2·2	2·0	8·2	7·6	14·2	13·1
23	13 50·8	13 53·0	13 12·9	2·3	2·1	8·3	7·7	14·3	13·2
24	13 51·0	13 53·3	13 13·1	2·4	2·2	8·4	7·8	14·4	13·3
25	13 51·3	13 53·5	13 13·4	2·5	2·3	8·5	7·9	14·5	13·4
26	13 51·5	13 53·8	13 13·6	2·6	2·4	8·6	8·0	14·6	13·5
27	13 51·8	13 54·0	13 13·9	2·7	2·5	8·7	8·0	14·7	13·6
28	13 52·0	13 54·3	13 14·1	2·8	2·6	8·8	8·1	14·8	13·7
29	13 52·3	13 54·5	13 14·3	2·9	2·7	8·9	8·2	14·9	13·8
30	13 52·5	13 54·8	13 14·6	3·0	2·8	9·0	8·3	15·0	13·9
31	13 52·8	13 55·0	13 14·8	3·1	2·9	9·1	8·4	15·1	14·0
32	13 53·0	13 55·3	13 15·1	3·2	3·0	9·2	8·5	15·2	14·1
33	13 53·3	13 55·5	13 15·3	3·3	3·1	9·3	8·6	15·3	14·2
34	13 53·5	13 55·8	13 15·5	3·4	3·1	9·4	8·7	15·4	14·2
35	13 53·8	13 56·0	13 15·8	3·5	3·2	9·5	8·8	15·5	14·3
36	13 54·0	13 56·3	13 16·0	3·6	3·3	9·6	8·9	15·6	14·4
37	13 54·3	13 56·5	13 16·2	3·7	3·4	9·7	9·0	15·7	14·5
38	13 54·5	13 56·8	13 16·5	3·8	3·5	9·8	9·1	15·8	14·6
39	13 54·8	13 57·0	13 16·7	3·9	3·6	9·9	9·2	15·9	14·7
40	13 55·0	13 57·3	13 17·0	4·0	3·7	10·0	9·3	16·0	14·8
41	13 55·3	13 57·5	13 17·2	4·1	3·8	10·1	9·3	16·1	14·9
42	13 55·5	13 57·8	13 17·4	4·2	3·9	10·2	9·4	16·2	15·0
43	13 55·8	13 58·0	13 17·7	4·3	4·0	10·3	9·5	16·3	15·1
44	13 56·0	13 58·3	13 17·9	4·4	4·1	10·4	9·6	16·4	15·2
45	13 56·3	13 58·5	13 18·2	4·5	4·2	10·5	9·7	16·5	15·3
46	13 56·5	13 58·8	13 18·4	4·6	4·3	10·6	9·8	16·6	15·4
47	13 56·8	13 59·0	13 18·6	4·7	4·3	10·7	9·9	16·7	15·4
48	13 57·0	13 59·3	13 18·9	4·8	4·4	10·8	10·0	16·8	15·5
49	13 57·3	13 59·5	13 19·1	4·9	4·5	10·9	10·1	16·9	15·6
50	13 57·5	13 59·8	13 19·3	5·0	4·6	11·0	10·2	17·0	15·7
51	13 57·8	14 00·0	13 19·6	5·1	4·7	11·1	10·3	17·1	15·8
52	13 58·0	14 00·3	13 19·8	5·2	4·8	11·2	10·4	17·2	15·9
53	13 58·3	14 00·5	13 20·1	5·3	4·9	11·3	10·5	17·3	16·0
54	13 58·5	14 00·8	13 20·3	5·4	5·0	11·4	10·5	17·4	16·1
55	13 58·8	14 01·0	13 20·5	5·5	5·1	11·5	10·6	17·5	16·2
56	13 59·0	14 01·3	13 20·8	5·6	5·2	11·6	10·7	17·6	16·3
57	13 59·3	14 01·5	13 21·0	5·7	5·3	11·7	10·8	17·7	16·4
58	13 59·5	14 01·8	13 21·3	5·8	5·4	11·8	10·9	17·8	16·5
59	13 59·8	14 02·0	13 21·5	5·9	5·5	11·9	11·0	17·9	16·6
60	14 00·0	14 02·3	13 21·7	6·0	5·6	12·0	11·1	18·0	16·7

ᵐ 56	SUN PLANETS	ARIES	MOON	v or d	Corrⁿ	v or d	Corrⁿ	v or d	Corrⁿ
s	° ′	° ′	° ′	′	′	′	′	′	′
00	14 00·0	14 02·3	13 21·7	0·0	0·0	6·0	5·7	12·0	11·3
01	14 00·3	14 02·6	13 22·0	0·1	0·1	6·1	5·7	12·1	11·4
02	14 00·5	14 02·8	13 22·2	0·2	0·2	6·2	5·8	12·2	11·5
03	14 00·8	14 03·1	13 22·4	0·3	0·3	6·3	5·9	12·3	11·6
04	14 01·0	14 03·3	13 22·7	0·4	0·4	6·4	6·0	12·4	11·7
05	14 01·3	14 03·6	13 22·9	0·5	0·5	6·5	6·1	12·5	11·8
06	14 01·5	14 03·8	13 23·2	0·6	0·6	6·6	6·2	12·6	11·9
07	14 01·8	14 04·1	13 23·4	0·7	0·7	6·7	6·3	12·7	12·0
08	14 02·0	14 04·3	13 23·6	0·8	0·8	6·8	6·4	12·8	12·1
09	14 02·3	14 04·6	13 23·9	0·9	0·8	6·9	6·5	12·9	12·1
10	14 02·5	14 04·8	13 24·1	1·0	0·9	7·0	6·6	13·0	12·2
11	14 02·8	14 05·1	13 24·4	1·1	1·0	7·1	6·7	13·1	12·3
12	14 03·0	14 05·3	13 24·6	1·2	1·1	7·2	6·8	13·2	12·4
13	14 03·3	14 05·6	13 24·8	1·3	1·2	7·3	6·9	13·3	12·5
14	14 03·5	14 05·8	13 25·1	1·4	1·3	7·4	7·0	13·4	12·6
15	14 03·8	14 06·1	13 25·3	1·5	1·4	7·5	7·1	13·5	12·7
16	14 04·0	14 06·3	13 25·6	1·6	1·5	7·6	7·2	13·6	12·8
17	14 04·3	14 06·6	13 25·8	1·7	1·6	7·7	7·3	13·7	12·9
18	14 04·5	14 06·8	13 26·0	1·8	1·7	7·8	7·3	13·8	13·0
19	14 04·8	14 07·1	13 26·3	1·9	1·8	7·9	7·4	13·9	13·1
20	14 05·0	14 07·3	13 26·5	2·0	1·9	8·0	7·5	14·0	13·2
21	14 05·3	14 07·6	13 26·7	2·1	2·0	8·1	7·6	14·1	13·3
22	14 05·5	14 07·8	13 27·0	2·2	2·1	8·2	7·7	14·2	13·4
23	14 05·8	14 08·1	13 27·2	2·3	2·2	8·3	7·8	14·3	13·5
24	14 06·0	14 08·3	13 27·5	2·4	2·3	8·4	7·9	14·4	13·6
25	14 06·3	14 08·6	13 27·7	2·5	2·4	8·5	8·0	14·5	13·7
26	14 06·5	14 08·8	13 27·9	2·6	2·4	8·6	8·1	14·6	13·7
27	14 06·8	14 09·1	13 28·2	2·7	2·5	8·7	8·2	14·7	13·8
28	14 07·0	14 09·3	13 28·4	2·8	2·6	8·8	8·3	14·8	13·9
29	14 07·3	14 09·6	13 28·7	2·9	2·7	8·9	8·4	14·9	14·0
30	14 07·5	14 09·8	13 28·9	3·0	2·8	9·0	8·5	15·0	14·1
31	14 07·8	14 10·1	13 29·1	3·1	2·9	9·1	8·6	15·1	14·2
32	14 08·0	14 10·3	13 29·4	3·2	3·0	9·2	8·7	15·2	14·3
33	14 08·3	14 10·6	13 29·6	3·3	3·1	9·3	8·8	15·3	14·4
34	14 08·5	14 10·8	13 29·8	3·4	3·2	9·4	8·9	15·4	14·5
35	14 08·8	14 11·1	13 30·1	3·5	3·3	9·5	8·9	15·5	14·6
36	14 09·0	14 11·3	13 30·3	3·6	3·4	9·6	9·0	15·6	14·7
37	14 09·3	14 11·6	13 30·6	3·7	3·5	9·7	9·1	15·7	14·8
38	14 09·5	14 11·8	13 30·8	3·8	3·6	9·8	9·2	15·8	14·9
39	14 09·8	14 12·1	13 31·0	3·9	3·7	9·9	9·3	15·9	15·0
40	14 10·0	14 12·3	13 31·3	4·0	3·8	10·0	9·4	16·0	15·1
41	14 10·3	14 12·6	13 31·5	4·1	3·9	10·1	9·5	16·1	15·2
42	14 10·5	14 12·8	13 31·8	4·2	4·0	10·2	9·6	16·2	15·3
43	14 10·8	14 13·1	13 32·0	4·3	4·0	10·3	9·7	16·3	15·3
44	14 11·0	14 13·3	13 32·2	4·4	4·1	10·4	9·8	16·4	15·4
45	14 11·3	14 13·6	13 32·5	4·5	4·2	10·5	9·9	16·5	15·5
46	14 11·5	14 13·8	13 32·7	4·6	4·3	10·6	10·0	16·6	15·6
47	14 11·8	14 14·1	13 32·9	4·7	4·4	10·7	10·1	16·7	15·7
48	14 12·0	14 14·3	13 33·2	4·8	4·5	10·8	10·2	16·8	15·8
49	14 12·3	14 14·6	13 33·4	4·9	4·6	10·9	10·3	16·9	15·9
50	14 12·5	14 14·8	13 33·7	5·0	4·7	11·0	10·4	17·0	16·0
51	14 12·8	14 15·1	13 33·9	5·1	4·8	11·1	10·5	17·1	16·1
52	14 13·0	14 15·3	13 34·1	5·2	4·9	11·2	10·5	17·2	16·2
53	14 13·3	14 15·6	13 34·4	5·3	5·0	11·3	10·6	17·3	16·3
54	14 13·5	14 15·8	13 34·6	5·4	5·1	11·4	10·7	17·4	16·4
55	14 13·8	14 16·1	13 34·9	5·5	5·2	11·5	10·8	17·5	16·5
56	14 14·0	14 16·3	13 35·1	5·6	5·3	11·6	10·9	17·6	16·6
57	14 14·3	14 16·6	13 35·3	5·7	5·4	11·7	11·0	17·7	16·7
58	14 14·5	14 16·8	13 35·6	5·8	5·5	11·8	11·1	17·8	16·8
59	14 14·8	14 17·1	13 35·8	5·9	5·6	11·9	11·2	17·9	16·9
60	14 15·0	14 17·3	13 36·1	6·0	5·7	12·0	11·3	18·0	17·0

ᵐ 57	SUN PLANETS	ARIES	MOON	v or d	Corrⁿ	v or d	Corrⁿ	v or d	Corrⁿ
s	° ′	° ′	° ′	′	′	′	′	′	′
00	14 15·0	14 17·3	13 36·1	0·0	0·0	6·0	5·8	12·0	11·5
01	14 15·3	14 17·6	13 36·3	0·1	0·1	6·1	5·8	12·1	11·6
02	14 15·5	14 17·8	13 36·5	0·2	0·2	6·2	5·9	12·2	11·7
03	14 15·8	14 18·1	13 36·8	0·3	0·3	6·3	6·0	12·3	11·8
04	14 16·0	14 18·3	13 37·0	0·4	0·4	6·4	6·1	12·4	11·9
05	14 16·3	14 18·6	13 37·2	0·5	0·5	6·5	6·2	12·5	12·0
06	14 16·5	14 18·8	13 37·5	0·6	0·6	6·6	6·3	12·6	12·1
07	14 16·8	14 19·1	13 37·7	0·7	0·7	6·7	6·4	12·7	12·2
08	14 17·0	14 19·3	13 38·0	0·8	0·8	6·8	6·5	12·8	12·3
09	14 17·3	14 19·6	13 38·2	0·9	0·9	6·9	6·6	12·9	12·4
10	14 17·5	14 19·8	13 38·4	1·0	1·0	7·0	6·7	13·0	12·5
11	14 17·8	14 20·1	13 38·7	1·1	1·1	7·1	6·8	13·1	12·6
12	14 18·0	14 20·3	13 38·9	1·2	1·2	7·2	6·9	13·2	12·7
13	14 18·3	14 20·6	13 39·2	1·3	1·2	7·3	7·0	13·3	12·7
14	14 18·5	14 20·9	13 39·4	1·4	1·3	7·4	7·1	13·4	12·8
15	14 18·8	14 21·1	13 39·6	1·5	1·4	7·5	7·2	13·5	12·9
16	14 19·0	14 21·4	13 39·9	1·6	1·5	7·6	7·3	13·6	13·0
17	14 19·3	14 21·6	13 40·1	1·7	1·6	7·7	7·4	13·7	13·1
18	14 19·5	14 21·9	13 40·3	1·8	1·7	7·8	7·5	13·8	13·2
19	14 19·8	14 22·1	13 40·6	1·9	1·8	7·9	7·6	13·9	13·3
20	14 20·0	14 22·4	13 40·8	2·0	1·9	8·0	7·7	14·0	13·4
21	14 20·3	14 22·6	13 41·1	2·1	2·0	8·1	7·8	14·1	13·5
22	14 20·5	14 22·9	13 41·3	2·2	2·1	8·2	7·9	14·2	13·6
23	14 20·8	14 23·1	13 41·5	2·3	2·2	8·3	8·0	14·3	13·7
24	14 21·0	14 23·4	13 41·8	2·4	2·3	8·4	8·1	14·4	13·8
25	14 21·3	14 23·6	13 42·0	2·5	2·4	8·5	8·1	14·5	13·9
26	14 21·5	14 23·9	13 42·3	2·6	2·5	8·6	8·2	14·6	14·0
27	14 21·8	14 24·1	13 42·5	2·7	2·6	8·7	8·3	14·7	14·1
28	14 22·0	14 24·4	13 42·7	2·8	2·7	8·8	8·4	14·8	14·2
29	14 22·3	14 24·6	13 43·0	2·9	2·8	8·9	8·5	14·9	14·3
30	14 22·5	14 24·9	13 43·2	3·0	2·9	9·0	8·6	15·0	14·4
31	14 22·8	14 25·1	13 43·4	3·1	3·0	9·1	8·7	15·1	14·5
32	14 23·0	14 25·4	13 43·7	3·2	3·1	9·2	8·8	15·2	14·6
33	14 23·3	14 25·6	13 43·9	3·3	3·2	9·3	8·9	15·3	14·7
34	14 23·5	14 25·9	13 44·2	3·4	3·3	9·4	9·0	15·4	14·8
35	14 23·8	14 26·1	13 44·4	3·5	3·4	9·5	9·1	15·5	14·9
36	14 24·0	14 26·4	13 44·6	3·6	3·5	9·6	9·2	15·6	15·0
37	14 24·3	14 26·6	13 44·9	3·7	3·5	9·7	9·3	15·7	15·0
38	14 24·5	14 26·9	13 45·1	3·8	3·6	9·8	9·4	15·8	15·1
39	14 24·8	14 27·1	13 45·4	3·9	3·7	9·9	9·5	15·9	15·2
40	14 25·0	14 27·4	13 45·6	4·0	3·8	10·0	9·6	16·0	15·3
41	14 25·3	14 27·6	13 45·8	4·1	3·9	10·1	9·7	16·1	15·4
42	14 25·5	14 27·9	13 46·1	4·2	4·0	10·2	9·8	16·2	15·5
43	14 25·8	14 28·1	13 46·3	4·3	4·1	10·3	9·9	16·3	15·6
44	14 26·0	14 28·4	13 46·5	4·4	4·2	10·4	10·0	16·4	15·7
45	14 26·3	14 28·6	13 46·8	4·5	4·3	10·5	10·1	16·5	15·8
46	14 26·5	14 28·9	13 47·0	4·6	4·4	10·6	10·2	16·6	15·9
47	14 26·8	14 29·1	13 47·3	4·7	4·5	10·7	10·3	16·7	16·0
48	14 27·0	14 29·4	13 47·5	4·8	4·6	10·8	10·4	16·8	16·1
49	14 27·3	14 29·6	13 47·7	4·9	4·7	10·9	10·4	16·9	16·2
50	14 27·5	14 29·9	13 48·0	5·0	4·8	11·0	10·5	17·0	16·3
51	14 27·8	14 30·1	13 48·2	5·1	4·9	11·1	10·6	17·1	16·4
52	14 28·0	14 30·4	13 48·5	5·2	5·0	11·2	10·7	17·2	16·5
53	14 28·3	14 30·6	13 48·7	5·3	5·1	11·3	10·8	17·3	16·6
54	14 28·5	14 30·9	13 48·9	5·4	5·2	11·4	10·9	17·4	16·7
55	14 28·8	14 31·1	13 49·2	5·5	5·3	11·5	11·0	17·5	16·8
56	14 29·0	14 31·4	13 49·4	5·6	5·4	11·6	11·1	17·6	16·9
57	14 29·3	14 31·6	13 49·7	5·7	5·5	11·7	11·2	17·7	17·0
58	14 29·5	14 31·9	13 49·9	5·8	5·6	11·8	11·3	17·8	17·1
59	14 29·8	14 32·1	13 50·1	5·9	5·7	11·9	11·4	17·9	17·2
60	14 30·0	14 32·4	13 50·4	6·0	5·8	12·0	11·5	18·0	17·3

58m	SUN PLANETS	ARIES	MOON	v or d	Corrn	v or d	Corrn	v or d	Corrn
s	° ′	° ′	° ′	′	′	′	′	′	′
00	14 30·0	14 32·4	13 50·4	0·0	0·0	6·0	5·9	12·0	11·7
01	14 30·3	14 32·6	13 50·6	0·1	0·1	6·1	5·9	12·1	11·8
02	14 30·5	14 32·9	13 50·8	0·2	0·2	6·2	6·0	12·2	11·9
03	14 30·8	14 33·1	13 51·1	0·3	0·3	6·3	6·1	12·3	12·0
04	14 31·0	14 33·4	13 51·3	0·4	0·4	6·4	6·2	12·4	12·1
05	14 31·3	14 33·6	13 51·6	0·5	0·5	6·5	6·3	12·5	12·2
06	14 31·5	14 33·9	13 51·8	0·6	0·6	6·6	6·4	12·6	12·3
07	14 31·8	14 34·1	13 52·0	0·7	0·7	6·7	6·5	12·7	12·4
08	14 32·0	14 34·4	13 52·3	0·8	0·8	6·8	6·6	12·8	12·5
09	14 32·3	14 34·6	13 52·5	0·9	0·9	6·9	6·7	12·9	12·6
10	14 32·5	14 34·9	13 52·8	1·0	1·0	7·0	6·8	13·0	12·7
11	14 32·8	14 35·1	13 53·0	1·1	1·1	7·1	6·9	13·1	12·8
12	14 33·0	14 35·4	13 53·2	1·2	1·2	7·2	7·0	13·2	12·9
13	14 33·3	14 35·6	13 53·5	1·3	1·3	7·3	7·1	13·3	13·0
14	14 33·5	14 35·9	13 53·7	1·4	1·4	7·4	7·2	13·4	13·1
15	14 33·8	14 36·1	13 53·9	1·5	1·5	7·5	7·3	13·5	13·2
16	14 34·0	14 36·4	13 54·2	1·6	1·6	7·6	7·4	13·6	13·3
17	14 34·3	14 36·6	13 54·4	1·7	1·7	7·7	7·5	13·7	13·4
18	14 34·5	14 36·9	13 54·7	1·8	1·8	7·8	7·6	13·8	13·5
19	14 34·8	14 37·1	13 54·9	1·9	1·9	7·9	7·7	13·9	13·6
20	14 35·0	14 37·4	13 55·1	2·0	2·0	8·0	7·8	14·0	13·7
21	14 35·3	14 37·6	13 55·4	2·1	2·0	8·1	7·9	14·1	13·7
22	14 35·5	14 37·9	13 55·6	2·2	2·1	8·2	8·0	14·2	13·8
23	14 35·8	14 38·1	13 55·9	2·3	2·2	8·3	8·1	14·3	13·9
24	14 36·0	14 38·4	13 56·1	2·4	2·3	8·4	8·2	14·4	14·0
25	14 36·3	14 38·6	13 56·3	2·5	2·4	8·5	8·3	14·5	14·1
26	14 36·5	14 38·9	13 56·6	2·6	2·5	8·6	8·4	14·6	14·2
27	14 36·8	14 39·2	13 56·8	2·7	2·6	8·7	8·5	14·7	14·3
28	14 37·0	14 39·4	13 57·0	2·8	2·7	8·8	8·6	14·8	14·4
29	14 37·3	14 39·7	13 57·3	2·9	2·8	8·9	8·7	14·9	14·5
30	14 37·5	14 39·9	13 57·5	3·0	2·9	9·0	8·8	15·0	14·6
31	14 37·8	14 40·2	13 57·8	3·1	3·0	9·1	8·9	15·1	14·7
32	14 38·0	14 40·4	13 58·0	3·2	3·1	9·2	9·0	15·2	14·8
33	14 38·3	14 40·7	13 58·2	3·3	3·2	9·3	9·1	15·3	14·9
34	14 38·5	14 40·9	13 58·5	3·4	3·3	9·4	9·2	15·4	15·0
35	14 38·8	14 41·2	13 58·7	3·5	3·4	9·5	9·3	15·5	15·1
36	14 39·0	14 41·4	13 59·0	3·6	3·5	9·6	9·4	15·6	15·2
37	14 39·3	14 41·7	13 59·2	3·7	3·6	9·7	9·5	15·7	15·3
38	14 39·5	14 41·9	13 59·4	3·8	3·7	9·8	9·6	15·8	15·4
39	14 39·8	14 42·2	13 59·7	3·9	3·8	9·9	9·7	15·9	15·5
40	14 40·0	14 42·4	13 59·9	4·0	3·9	10·0	9·8	16·0	15·6
41	14 40·3	14 42·7	14 00·1	4·1	4·0	10·1	9·8	16·1	15·7
42	14 40·5	14 42·9	14 00·4	4·2	4·1	10·2	9·9	16·2	15·8
43	14 40·8	14 43·2	14 00·6	4·3	4·2	10·3	10·0	16·3	15·9
44	14 41·0	14 43·4	14 00·9	4·4	4·3	10·4	10·1	16·4	16·0
45	14 41·3	14 43·7	14 01·1	4·5	4·4	10·5	10·2	16·5	16·1
46	14 41·5	14 43·9	14 01·3	4·6	4·5	10·6	10·3	16·6	16·2
47	14 41·8	14 44·2	14 01·6	4·7	4·6	10·7	10·4	16·7	16·3
48	14 42·0	14 44·4	14 01·8	4·8	4·7	10·8	10·5	16·8	16·4
49	14 42·3	14 44·7	14 02·1	4·9	4·8	10·9	10·6	16·9	16·5
50	14 42·5	14 44·9	14 02·3	5·0	4·9	11·0	10·7	17·0	16·6
51	14 42·8	14 45·2	14 02·5	5·1	5·0	11·1	10·8	17·1	16·7
52	14 43·0	14 45·4	14 02·8	5·2	5·1	11·2	10·9	17·2	16·8
53	14 43·3	14 45·7	14 03·0	5·3	5·2	11·3	11·0	17·3	16·9
54	14 43·5	14 45·9	14 03·3	5·4	5·3	11·4	11·1	17·4	17·0
55	14 43·8	14 46·2	14 03·5	5·5	5·4	11·5	11·2	17·5	17·1
56	14 44·0	14 46·4	14 03·7	5·6	5·5	11·6	11·3	17·6	17·2
57	14 44·3	14 46·7	14 04·0	5·7	5·6	11·7	11·4	17·7	17·3
58	14 44·5	14 46·9	14 04·2	5·8	5·7	11·8	11·5	17·8	17·4
59	14 44·8	14 47·2	14 04·4	5·9	5·8	11·9	11·6	17·9	17·5
60	14 45·0	14 47·4	14 04·7	6·0	5·9	12·0	11·7	18·0	17·6

59m	SUN PLANETS	ARIES	MOON	v or d	Corrn	v or d	Corrn	v or d	Corrn
s	° ′	° ′	° ′	′	′	′	′	′	′
00	14 45·0	14 47·4	14 04·7	0·0	0·0	6·0	6·0	12·0	11·9
01	14 45·3	14 47·7	14 04·9	0·1	0·1	6·1	6·0	12·1	12·0
02	14 45·5	14 47·9	14 05·2	0·2	0·2	6·2	6·1	12·2	12·1
03	14 45·8	14 48·2	14 05·4	0·3	0·3	6·3	6·2	12·3	12·2
04	14 46·0	14 48·4	14 05·6	0·4	0·4	6·4	6·3	12·4	12·3
05	14 46·3	14 48·7	14 05·9	0·5	0·5	6·5	6·4	12·5	12·4
06	14 46·5	14 48·9	14 06·1	0·6	0·6	6·6	6·5	12·6	12·5
07	14 46·8	14 49·2	14 06·4	0·7	0·7	6·7	6·6	12·7	12·6
08	14 47·0	14 49·4	14 06·6	0·8	0·8	6·8	6·7	12·8	12·7
09	14 47·3	14 49·7	14 06·8	0·9	0·9	6·9	6·8	12·9	12·8
10	14 47·5	14 49·9	14 07·1	1·0	1·0	7·0	6·9	13·0	12·9
11	14 47·8	14 50·2	14 07·3	1·1	1·1	7·1	7·0	13·1	13·0
12	14 48·0	14 50·4	14 07·5	1·2	1·2	7·2	7·1	13·2	13·1
13	14 48·3	14 50·7	14 07·8	1·3	1·3	7·3	7·2	13·3	13·2
14	14 48·5	14 50·9	14 08·0	1·4	1·4	7·4	7·3	13·4	13·3
15	14 48·8	14 51·2	14 08·3	1·5	1·5	7·5	7·4	13·5	13·4
16	14 49·0	14 51·4	14 08·5	1·6	1·6	7·6	7·5	13·6	13·5
17	14 49·3	14 51·7	14 08·7	1·7	1·7	7·7	7·6	13·7	13·6
18	14 49·5	14 51·9	14 09·0	1·8	1·8	7·8	7·7	13·8	13·7
19	14 49·8	14 52·2	14 09·2	1·9	1·9	7·9	7·8	13·9	13·8
20	14 50·0	14 52·4	14 09·5	2·0	2·0	8·0	7·9	14·0	13·9
21	14 50·3	14 52·7	14 09·7	2·1	2·1	8·1	8·0	14·1	14·0
22	14 50·5	14 52·9	14 09·9	2·2	2·2	8·2	8·1	14·2	14·1
23	14 50·8	14 53·2	14 10·2	2·3	2·3	8·3	8·2	14·3	14·2
24	14 51·0	14 53·4	14 10·4	2·4	2·4	8·4	8·3	14·4	14·3
25	14 51·3	14 53·7	14 10·6	2·5	2·5	8·5	8·4	14·5	14·4
26	14 51·5	14 53·9	14 10·9	2·6	2·6	8·6	8·5	14·6	14·5
27	14 51·8	14 54·2	14 11·1	2·7	2·7	8·7	8·6	14·7	14·6
28	14 52·0	14 54·4	14 11·4	2·8	2·8	8·8	8·7	14·8	14·7
29	14 52·3	14 54·7	14 11·6	2·9	2·9	8·9	8·8	14·9	14·8
30	14 52·5	14 54·9	14 11·8	3·0	3·0	9·0	8·9	15·0	14·9
31	14 52·8	14 55·2	14 12·1	3·1	3·1	9·1	9·0	15·1	15·0
32	14 53·0	14 55·4	14 12·3	3·2	3·2	9·2	9·1	15·2	15·1
33	14 53·3	14 55·7	14 12·6	3·3	3·3	9·3	9·2	15·3	15·2
34	14 53·5	14 55·9	14 12·8	3·4	3·4	9·4	9·3	15·4	15·3
35	14 53·8	14 56·2	14 13·0	3·5	3·5	9·5	9·4	15·5	15·4
36	14 54·0	14 56·4	14 13·3	3·6	3·6	9·6	9·5	15·6	15·5
37	14 54·3	14 56·7	14 13·5	3·7	3·7	9·7	9·6	15·7	15·6
38	14 54·5	14 56·9	14 13·8	3·8	3·8	9·8	9·7	15·8	15·7
39	14 54·8	14 57·2	14 14·0	3·9	3·9	9·9	9·8	15·9	15·8
40	14 55·0	14 57·5	14 14·2	4·0	4·0	10·0	9·9	16·0	15·9
41	14 55·3	14 57·7	14 14·5	4·1	4·1	10·1	10·0	16·1	16·0
42	14 55·5	14 58·0	14 14·7	4·2	4·2	10·2	10·1	16·2	16·1
43	14 55·8	14 58·2	14 14·9	4·3	4·3	10·3	10·2	16·3	16·2
44	14 56·0	14 58·5	14 15·2	4·4	4·4	10·4	10·3	16·4	16·3
45	14 56·3	14 58·7	14 15·4	4·5	4·5	10·5	10·4	16·5	16·4
46	14 56·5	14 59·0	14 15·7	4·6	4·6	10·6	10·5	16·6	16·5
47	14 56·8	14 59·2	14 15·9	4·7	4·7	10·7	10·6	16·7	16·6
48	14 57·0	14 59·5	14 16·1	4·8	4·8	10·8	10·7	16·8	16·7
49	14 57·3	14 59·7	14 16·4	4·9	4·9	10·9	10·8	16·9	16·8
50	14 57·5	15 00·0	14 16·6	5·0	5·0	11·0	10·9	17·0	16·9
51	14 57·8	15 00·2	14 16·9	5·1	5·1	11·1	11·0	17·1	17·0
52	14 58·0	15 00·5	14 17·1	5·2	5·2	11·2	11·1	17·2	17·1
53	14 58·3	15 00·7	14 17·3	5·3	5·3	11·3	11·2	17·3	17·2
54	14 58·5	15 01·0	14 17·6	5·4	5·4	11·4	11·3	17·4	17·3
55	14 58·8	15 01·2	14 17·8	5·5	5·5	11·5	11·4	17·5	17·4
56	14 59·0	15 01·5	14 18·0	5·6	5·6	11·6	11·5	17·6	17·5
57	14 59·3	15 01·7	14 18·3	5·7	5·7	11·7	11·6	17·7	17·6
58	14 59·5	15 02·0	14 18·5	5·8	5·8	11·8	11·7	17·8	17·7
59	14 59·8	15 02·2	14 18·8	5·9	5·9	11·9	11·8	17·9	17·8
60	15 00·0	15 02·5	14 19·0	6·0	6·0	12·0	11·9	18·0	17·9

TABLES FOR INTERPOLATING SUNRISE, MOONRISE, ETC.

TABLE I—FOR LATITUDE

Tabular Interval			Difference between the times for consecutive latitudes															
10°	5°	2°	5^{m}	10^{m}	15^{m}	20^{m}	25^{m}	30^{m}	35^{m}	40^{m}	45^{m}	50^{m}	55^{m}	60^{m}	$1^{h}\ 05^{m}$	$1^{h}\ 10^{m}$	$1^{h}\ 15^{m}$	$1^{h}\ 20^{m}$
° ′	° ′	° ′	m	m	m	m	m	m	m	m	m	m	m	m	h m	h m	h m	h m
0 30	**0 15**	**0 06**	0	0	1	1	1	1	1	2	2	2	2	2	0 02	0 02	0 02	0 02
1 00	**0 30**	**0 12**	0	1	1	2	2	3	3	3	4	4	4	5	05	05	05	05
1 30	**0 45**	**0 18**	1	1	2	3	3	4	4	5	5	6	7	7	07	07	07	07
2 00	**1 00**	**0 24**	1	2	3	4	5	5	6	7	7	8	9	10	10	10	10	10
2 30	**1 15**	**0 30**	1	2	4	5	6	7	8	9	9	10	11	12	12	13	13	13
3 00	**1 30**	**0 36**	1	3	4	6	7	8	9	10	11	12	13	14	0 15	0 15	0 16	0 16
3 30	**1 45**	**0 42**	2	3	5	7	8	10	11	12	13	14	16	17	18	18	19	19
4 00	**2 00**	**0 48**	2	4	6	8	9	11	13	14	15	16	18	19	20	21	22	22
4 30	**2 15**	**0 54**	2	4	7	9	11	13	15	16	18	19	21	22	23	24	25	26
5 00	**2 30**	**1 00**	2	5	7	10	12	14	16	18	20	22	23	25	26	27	28	29
5 30	**2 45**	**1 06**	3	5	8	11	13	16	18	20	22	24	26	28	0 29	0 30	0 31	0 32
6 00	**3 00**	**1 12**	3	6	9	12	14	17	20	22	24	26	29	31	32	33	34	36
6 30	**3 15**	**1 18**	3	6	10	13	16	19	22	24	26	29	31	34	36	37	38	40
7 00	**3 30**	**1 24**	3	7	10	14	17	20	23	26	29	31	34	37	39	41	42	44
7 30	**3 45**	**1 30**	4	7	11	15	18	22	25	28	31	34	37	40	43	44	46	48
8 00	**4 00**	**1 36**	4	8	12	16	20	23	27	30	34	37	41	44	0 47	0 48	0 51	0 53
8 30	**4 15**	**1 42**	4	8	13	17	21	25	29	33	36	40	44	48	0 51	0 53	0 56	0 58
9 00	**4 30**	**1 48**	4	9	13	18	22	27	31	35	39	43	47	52	0 55	0 58	1 01	1 04
9 30	**4 45**	**1 54**	5	9	14	19	24	28	33	38	42	47	51	56	1 00	1 04	1 08	1 12
10 00	**5 00**	**2 00**	5	10	15	20	25	30	35	40	45	50	55	60	1 05	1 10	1 15	1 20

Table I is for interpolating the L.M.T. of sunrise, twilight, moonrise, etc., for latitude. It is to be entered, in the appropriate column on the left, with the difference between true latitude and the nearest tabular latitude which is *less* than the true latitude; and with the argument at the top which is the nearest value of the difference between the times for the tabular latitude and the next higher one; the correction so obtained is applied to the time for the tabular latitude; the sign of the correction can be seen by inspection. It is to be noted that the interpolation is not linear, so that when using this table it is essential to take out the tabular phenomenon for the latitude *less* than the true latitude.

TABLE II—FOR LONGITUDE

Long. East or West	Difference between the times for given date and preceding date (for east longitude) or for given date and following date (for west longitude)																	
							1^{h} +			1^{h} +								
	10^{m}	20^{m}	30^{m}	40^{m}	50^{m}	60^{m}	10^{m}	20^{m}	30^{m}	40^{m}	50^{m}	60^{m}	$2^{h}\ 10^{m}$	$2^{h}\ 20^{m}$	$2^{h}\ 30^{m}$	$2^{h}\ 40^{m}$	$2^{h}\ 50^{m}$	$3^{h}\ 00^{m}$
°	m	m	m	m	m	m	m	m	m	m	m	m	h m	h m	h m	h m	h m	h m
0	0	0	0	0	0	0	0	0	0	0	0	0	0 00	0 00	0 00	0 00	0 00	0 00
10	0	1	1	1	1	2	2	2	2	3	3	3	04	04	04	04	05	05
20	1	1	2	2	3	3	4	4	5	6	6	7	07	08	08	09	09	10
30	1	2	2	3	4	5	6	7	7	8	9	10	11	12	12	13	14	15
40	1	2	3	4	6	7	8	9	10	11	12	13	14	16	17	18	19	20
50	1	3	4	6	7	8	10	11	12	14	15	17	0 18	0 19	0 21	0 22	0 24	0 25
60	2	3	5	7	8	10	12	13	15	17	18	20	22	23	25	27	28	30
70	2	4	6	8	10	12	14	16	17	19	21	23	25	27	29	31	33	35
80	2	4	7	9	11	13	16	18	20	22	24	27	29	31	33	36	38	40
90	2	5	7	10	12	15	17	20	22	25	27	30	32	35	37	40	42	45
100	3	6	8	11	14	17	19	22	25	28	31	33	0 36	0 39	0 42	0 44	0 47	0 50
110	3	6	9	12	15	18	21	24	27	31	34	37	40	43	46	49	0 52	0 55
120	3	7	10	13	17	20	23	27	30	33	37	40	43	47	50	53	0 57	1 00
130	4	7	11	14	18	22	25	29	32	36	40	43	47	51	54	0 58	1 01	1 05
140	4	8	12	16	19	23	27	31	35	39	43	47	51	54	0 58	1 02	1 06	1 10
150	4	8	13	17	21	25	29	33	38	42	46	50	0 54	0 58	1 03	1 07	1 11	1 15
160	4	9	13	18	22	27	31	36	40	44	49	53	0 58	1 02	1 07	1 11	1 16	1 20
170	5	9	14	19	24	28	33	38	42	47	52	57	1 01	1 06	1 11	1 16	1 20	1 25
180	5	10	15	20	25	30	35	40	45	50	55	60	1 05	1 10	1 15	1 20	1 25	1 30

Table II is for interpolating the L.M.T. of moonrise, moonset and the Moon's meridian passage for longitude. It is entered with longitude and with the difference between the times for the given date and for the preceding date (in east longitudes) or following date (in west longitudes). The correction is normally *added* for west longitudes and *subtracted* for east longitudes, but if, as occasionally happens, the times become earlier each day instead of later, the signs of the corrections must be reversed.

U. S. GOVERNMENT PRINTING OFFICE : 1975 O - 529-462

INDEX TO SELECTED STARS, 1977

Name	No.	Mag.	S.H.A.	Dec.
			°	°
Acamar	**7**	3·1	316	S. 40
Achernar	**5**	0·6	336	S. 57
Acrux	**30**	1·1	174	S. 63
Adhara	**19**	1·6	256	S. 29
Aldebaran	**10**	1·1	291	N. 16
Alioth	**32**	1·7	167	N. 56
Alkaid	**34**	1·9	153	N. 49
Al Na'ir	**55**	2·2	28	S. 47
Alnilam	**15**	1·8	276	S. 1
Alphard	**25**	2·2	218	S. 9
Alphecca	**41**	2·3	127	N. 27
Alpheratz	**1**	2·2	358	N. 29
Altair	**51**	0·9	63	N. 9
Ankaa	**2**	2·4	354	S. 42
Antares	**42**	1·2	113	S. 26
Arcturus	**37**	0·2	146	N. 19
Atria	**43**	1·9	108	S. 69
Avior	**22**	1·7	234	S. 59
Bellatrix	**13**	1·7	279	N. 6
Betelgeuse	**16**	Var.*	272	N. 7
Canopus	**17**	−0·9	264	S. 53
Capella	**12**	0·2	281	N. 46
Deneb	**53**	1·3	50	N. 45
Denebola	**28**	2·2	183	N. 15
Diphda	**4**	2·2	349	S. 18
Dubhe	**27**	2·0	194	N. 62
Elnath	**14**	1·8	279	N. 29
Eltanin	**47**	2·4	91	N. 51
Enif	**54**	2·5	34	N. 10
Fomalhaut	**56**	1·3	16	S. 30
Gacrux	**31**	1·6	173	S. 57
Gienah	**29**	2·8	176	S. 17
Hadar	**35**	0·9	149	S. 60
Hamal	**6**	2·2	329	N. 23
Kaus Australis	**48**	2·0	84	S. 34
Kochab	**40**	2·2	137	N. 74
Markab	**57**	2·6	14	N. 15
Menkar	**8**	2·8	315	N. 4
Menkent	**36**	2·3	149	S. 36
Miaplacidus	**24**	1·8	222	S. 70
Mirfak	**9**	1·9	309	N. 50
Nunki	**50**	2·1	77	S. 26
Peacock	**52**	2·1	54	S. 57
Pollux	**21**	1·2	244	N. 28
Procyon	**20**	0·5	245	N. 5
Rasalhague	**46**	2·1	97	N. 13
Regulus	**26**	1·3	208	N. 12
Rigel	**11**	0·3	282	S. 8
Rigil Kentaurus	**38**	0·1	140	S. 61
Sabik	**44**	2·6	103	S. 16
Schedar	**3**	2·5	350	N. 56
Shaula	**45**	1·7	97	S. 37
Sirius	**18**	−1·6	259	S. 17
Spica	**33**	1·2	159	S. 11
Suhail	**23**	2·2	223	S. 43
Vega	**49**	0·1	81	N. 39
Zubenelgenubi	**39**	2·9	138	S. 16

No.	Name	Mag.	S.H.A.	Dec.
			°	°
1	*Alpheratz*	2·2	358	N. 29
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8	*Menkar*	2·8	315	N. 4
9	*Mirfak*	1·9	309	N. 50
10	*Aldebaran*	1·1	291	N. 16
11	*Rigel*	0·3	282	S. 8
12	*Capella*	0·2	281	N. 46
13	*Bellatrix*	1·7	279	N. 6
14	*Elnath*	1·8	279	N. 29
15	*Alnilam*	1·8	276	S. 1
16	*Betelgeuse*	Var.*	272	N. 7
17	*Canopus*	−0·9	264	S. 53
18	*Sirius*	−1·6	259	S. 17
19	*Adhara*	1·6	256	S. 29
20	*Procyon*	0·5	245	N. 5
21	*Pollux*	1·2	244	N. 28
22	*Avior*	1·7	234	S. 59
23	*Suhail*	2·2	223	S. 43
24	*Miaplacidus*	1·8	222	S. 70
25	*Alphard*	2·2	218	S. 9
26	*Regulus*	1·3	208	N. 12
27	*Dubhe*	2·0	194	N. 62
28	*Denebola*	2·2	183	N. 15
29	*Gienah*	2·8	176	S. 17
30	*Acrux*	1·1	174	S. 63
31	*Gacrux*	1·6	173	S. 57
32	*Alioth*	1·7	167	N. 56
33	*Spica*	1·2	159	S. 11
34	*Alkaid*	1·9	153	N. 49
35	*Hadar*	0·9	149	S. 60
36	*Menkent*	2·3	149	S. 36
37	*Arcturus*	0·2	146	N. 19
38	*Rigil Kentaurus*	0·1	140	S. 61
39	*Zubenelgenubi*	2·9	138	S. 16
40	*Kochab*	2·2	137	N. 74
41	*Alphecca*	2·3	127	N. 27
42	*Antares*	1·2	113	S. 26
43	*Atria*	1·9	108	S. 69
44	*Sabik*	2·6	103	S. 16
45	*Shaula*	1·7	97	S. 37
46	*Rasalhague*	2·1	97	N. 13
47	*Eltanin*	2·4	91	N. 51
48	*Kaus Australis*	2·0	84	S. 34
49	*Vega*	0·1	81	N. 39
50	*Nunki*	2·1	77	S. 26
51	*Altair*	0·9	63	N. 9
52	*Peacock*	2·1	54	S. 57
53	*Deneb*	1·3	50	N. 45
54	*Enif*	2·5	34	N. 10
55	*Al Na'ir*	2·2	28	S. 47
56	*Fomalhaut*	1·3	16	S. 30
57	*Markab*	2·6	14	N. 15

* 0·1—1·2

ALTITUDE CORRECTION TABLES 0°–35°—MOON

App. Alt.	0°–4° Corrn	5°–9° Corrn	10°–14° Corrn	15°–19° Corrn	20°–24° Corrn	25°–29° Corrn	30°–34° Corrn	App. Alt.
00′	0° 33·8′	5° 58·2′	10° 62·1′	15° 62·8′	20° 62·2′	25° 60·8′	30° 58·9′	00′
10	35·9	58·5	62·2	62·8	62·1	60·8	58·8	10
20	37·8	58·7	62·2	62·8	62·1	60·7	58·8	20
30	39·6	58·9	62·3	62·8	62·1	60·7	58·7	30
40	41·2	59·1	62·3	62·8	62·0	60·6	58·6	40
50	42·6	59·3	62·4	62·7	62·0	60·6	58·5	50
00	1 44·0	6 59·5	11 62·4	16 62·7	21 62·0	26 60·5	31 58·5	00
10	45·2	59·7	62·4	62·7	61·9	60·4	58·4	10
20	46·3	59·9	62·5	62·7	61·9	60·4	58·3	20
30	47·3	60·0	62·5	62·7	61·9	60·3	58·2	30
40	48·3	60·2	62·5	62·7	61·8	60·3	58·2	40
50	49·2	60·3	62·6	62·7	61·8	60·2	58·1	50
00	2 50·0	7 60·5	12 62·6	17 62·7	22 61·7	27 60·1	32 58·0	00
10	50·8	60·6	62·6	62·6	61·7	60·1	57·9	10
20	51·4	60·7	62·6	62·6	61·6	60·0	57·8	20
30	52·1	60·9	62·7	62·6	61·6	59·9	57·8	30
40	52·7	61·0	62·7	62·6	61·5	59·9	57·7	40
50	53·3	61·1	62·7	62·6	61·5	59·8	57·6	50
00	3 53·8	8 61·2	13 62·7	18 62·5	23 61·5	28 59·7	33 57·5	00
10	54·3	61·3	62·7	62·5	61·4	59·7	57·4	10
20	54·8	61·4	62·7	62·5	61·4	59·6	57·4	20
30	55·2	61·5	62·8	62·5	61·3	59·6	57·3	30
40	55·6	61·6	62·8	62·4	61·3	59·5	57·2	40
50	56·0	61·6	62·8	62·4	61·2	59·4	57·1	50
00	4 56·4	9 61·7	14 62·8	19 62·4	24 61·2	29 59·3	34 57·0	00
10	56·7	61·8	62·8	62·3	61·1	59·3	56·9	10
20	57·1	61·9	62·8	62·3	61·1	59·2	56·9	20
30	57·4	61·9	62·8	62·3	61·0	59·1	56·8	30
40	57·7	62·0	62·8	62·2	60·9	59·1	56·7	40
50	57·9	62·1	62·8	62·2	60·9	59·0	56·6	50

H.P.	L	U	L	U	L	U	L	U	L	U	L	U	L	U	H.P.
54·0′	0·3′	0·9′	0·3′	0·9′	0·4′	1·0′	0·5′	1·1′	0·6′	1·2′	0·7′	1·3′	0·9′	1·5′	54·0′
54·3	0·7	1·1	0·7	1·2	0·7	1·2	0·8	1·3	0·9	1·4	1·1	1·5	1·2	1·7	54·3
54·6	1·1	1·4	1·1	1·4	1·1	1·4	1·2	1·5	1·3	1·6	1·4	1·7	1·5	1·8	54·6
54·9	1·4	1·6	1·5	1·6	1·5	1·6	1·6	1·7	1·6	1·8	1·8	1·9	1·9	2·0	54·9
55·2	1·8	1·8	1·8	1·8	1·9	1·9	1·9	1·9	2·0	2·0	2·1	2·1	2·2	2·2	55·2
55·5	2·2	2·0	2·2	2·0	2·3	2·1	2·3	2·1	2·4	2·2	2·4	2·3	2·5	2·4	55·5
55·8	2·6	2·2	2·6	2·2	2·6	2·3	2·7	2·3	2·7	2·4	2·8	2·4	2·9	2·5	55·8
56·1	3·0	2·4	3·0	2·5	3·0	2·5	3·0	2·5	3·1	2·6	3·1	2·6	3·2	2·7	56·1
56·4	3·4	2·7	3·4	2·7	3·4	2·7	3·4	2·7	3·4	2·8	3·5	2·8	3·5	2·9	56·4
56·7	3·7	2·9	3·7	2·9	3·8	2·9	3·8	2·9	3·8	3·0	3·8	3·0	3·9	3·0	56·7
57·0	4·1	3·1	4·1	3·1	4·1	3·1	4·1	3·1	4·2	3·1	4·2	3·2	4·2	3·2	57·0
57·3	4·5	3·3	4·5	3·3	4·5	3·3	4·5	3·3	4·5	3·3	4·5	3·4	4·6	3·4	57·3
57·6	4·9	3·5	4·9	3·5	4·9	3·5	4·9	3·5	4·9	3·5	4·9	3·5	4·9	3·6	57·6
57·9	5·3	3·8	5·3	3·8	5·2	3·8	5·2	3·7	5·2	3·7	5·2	3·7	5·2	3·7	57·9
58·2	5·6	4·0	5·6	4·0	5·6	4·0	5·6	4·0	5·6	3·9	5·6	3·9	5·6	3·9	58·2
58·5	6·0	4·2	6·0	4·2	6·0	4·2	6·0	4·2	6·0	4·1	5·9	4·1	5·9	4·1	58·5
58·8	6·4	4·4	6·4	4·4	6·4	4·4	6·3	4·4	6·3	4·3	6·3	4·3	6·2	4·2	58·8
59·1	6·8	4·6	6·8	4·6	6·7	4·6	6·7	4·6	6·7	4·5	6·6	4·5	6·6	4·4	59·1
59·4	7·2	4·8	7·1	4·8	7·1	4·8	7·1	4·8	7·0	4·7	7·0	4·7	6·9	4·6	59·4
59·7	7·5	5·1	7·5	5·0	7·5	5·0	7·5	5·0	7·4	4·9	7·3	4·8	7·2	4·7	59·7
60·0	7·9	5·3	7·9	5·3	7·9	5·2	7·8	5·2	7·8	5·1	7·7	5·0	7·6	4·9	60·0
60·3	8·3	5·5	8·3	5·5	8·2	5·4	8·2	5·4	8·1	5·3	8·0	5·2	7·9	5·1	60·3
60·6	8·7	5·7	8·7	5·7	8·6	5·7	8·6	5·6	8·5	5·5	8·4	5·4	8·2	5·3	60·6
60·9	9·1	5·9	9·0	5·9	9·0	5·9	8·9	5·8	8·8	5·7	8·7	5·6	8·6	5·4	60·9
61·2	9·5	6·2	9·4	6·1	9·4	6·1	9·3	6·0	9·2	5·9	9·1	5·8	8·9	5·6	61·2
61·5	9·8	6·4	9·8	6·3	9·7	6·3	9·7	6·2	9·5	6·1	9·4	5·9	9·2	5·8	61·5

DIP

Ht. of Eye	Corrn	Ht. of Eye	Ht. of Eye	Corrn	Ht. of Eye
m		ft.	m		ft.
2·4		8·0	9·5		31·5
	−2·8′			−5·5′	
2·6		8·6	9·9		32·7
	−2·9			−5·6	
2·8		9·2	10·3		33·9
	−3·0			−5·7	
3·0		9·8	10·6		35·1
	−3·1			−5·8	
3·2		10·5	11·0		36·3
	−3·2			−5·9	
3·4		11·2	11·4		37·6
	−3·3			−6·0	
3·6		11·9	11·8		38·9
	−3·4			−6·1	
3·8		12·6	12·2		40·1
	−3·5			−6·2	
4·0		13·3	12·6		41·5
	−3·6			−6·3	
4·3		14·1	13·0		42·8
	−3·7			−6·4	
4·5		14·9	13·4		44·2
	−3·8			−6·5	
4·7		15·7	13·8		45·5
	−3·9			−6·6	
5·0		16·5	14·2		46·9
	−4·0			−6·7	
5·2		17·4	14·7		48·4
	−4·1			−6·8	
5·5		18·3	15·1		49·8
	−4·2			−6·9	
5·8		19·1	15·5		51·3
	−4·3			−7·0	
6·1		20·1	16·0		52·8
	−4·4			−7·1	
6·3		21·0	16·5		54·3
	−4·5			−7·2	
6·6		22·0	16·9		55·8
	−4·6			−7·3	
6·9		22·9	17·4		57·4
	−4·7			−7·4	
7·2		23·9	17·9		58·9
	−4·8			−7·5	
7·5		24·9	18·4		60·5
	−4·9			−7·6	
7·9		26·0	18·8		62·1
	−5·0			−7·7	
8·2		27·1	19·3		63·8
	−5·1			−7·8	
8·5		28·1	19·8		65·4
	−5·2			−7·9	
8·8		29·2	20·4		67·1
	−5·3			−8·0	
9·2		30·4	20·9		68·8
	−5·4			−8·1	
9·5		31·5	21·4		70·5

MOON CORRECTION TABLE

The correction is in two parts; the first correction is taken from the upper part of the table with argument apparent altitude, and the second from the lower part, with argument H.P., in the same column as that from which the first correction was taken. Separate corrections are given in the lower part for lower (L) and upper (U) limbs. All corrections are to be **added** to apparent altitude, *but 30′ is to be subtracted from the altitude of the upper limb.*

For corrections for pressure and temperature see page A4.

For bubble sextant observations ignore dip, take the mean of upper and lower limb corrections and subtract 15′ from the altitude.

App. Alt. = Apparent altitude = Sextant altitude corrected for index error and dip.

ALTITUDE CORRECTION TABLES 35°–90°—MOON

App. Alt.	35°–39°	40°–44°	45°–49°	50°–54°	55°–59°	60°–64°	65°–69°	70°–74°	75°–79°	80°–84°	85°–89°	App. Alt.
	Corr^n	Corr^n	Corr^n	Corr^n	Corr^n	Corr^n	Corr^n	Corr^n	Corr^n	Corr^n	Corr^n	
′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	′
00	35 56·5	40 53·7	45 50·5	50 46·9	55 43·1	60 38·9	65 34·6	70 30·1	75 25·3	80 20·5	85 15·6	00
10	56·4	53·6	50·4	46·8	42·9	38·8	34·4	29·9	25·2	20·4	15·5	10
20	56·3	53·5	50·2	46·7	42·8	38·7	34·3	29·7	25·0	20·2	15·3	20
30	56·2	53·4	50·1	46·5	42·7	38·5	34·1	29·6	24·9	20·0	15·1	30
40	56·2	53·3	50·0	46·4	42·5	38·4	34·0	29·4	24·7	19·9	15·0	40
50	56·1	53·2	49·9	46·3	42·4	38·2	33·8	29·3	24·5	19·7	14·8	50
00	36 56·0	41 53·1	46 49·8	51 46·2	56 42·3	61 38·1	66 33·7	71 29·1	76 24·4	81 19·6	86 14·6	00
10	55·9	53·0	49·7	46·0	42·1	37·9	33·5	29·0	24·2	19·4	14·5	10
20	55·8	52·8	49·5	45·9	42·0	37·8	33·4	28·8	24·1	19·2	14·3	20
30	55·7	52·7	49·4	45·8	41·8	37·7	33·2	28·7	23·9	19·1	14·1	30
40	55·6	52·6	49·3	45·7	41·7	37·5	33·1	28·5	23·8	18·9	14·0	40
50	55·5	52·5	49·2	45·5	41·6	37·4	32·9	28·3	23·6	18·7	13·8	50
00	37 55·4	42 52·4	47 49·1	52 45·4	57 41·4	62 37·2	67 32·8	72 28·2	77 23·4	82 18·6	87 13·7	00
10	55·3	52·3	49·0	45·3	41·3	37·1	32·6	28·0	23·3	18·4	13·5	10
20	55·2	52·2	48·8	45·2	41·2	36·9	32·5	27·9	23·1	18·2	13·3	20
30	55·1	52·1	48·7	45·0	41·0	36·8	32·3	27·7	22·9	18·1	13·2	30
40	55·0	52·0	48·6	44·9	40·9	36·6	32·2	27·6	22·8	17·9	13·0	40
50	55·0	51·9	48·5	44·8	40·8	36·5	32·0	27·4	22·6	17·8	12·8	50
00	38 54·9	43 51·8	48 48·4	53 44·6	58 40·6	63 36·4	68 31·9	73 27·2	78 22·5	83 17·6	88 12·7	00
10	54·8	51·7	48·2	44·5	40·5	36·2	31·7	27·1	22·3	17·4	12·5	10
20	54·7	51·6	48·1	44·4	40·3	36·1	31·6	26·9	22·1	17·3	12·3	20
30	54·6	51·5	48·0	44·2	40·2	35·9	31·4	26·8	22·0	17·1	12·2	30
40	54·5	51·4	47·9	44·1	40·1	35·8	31·3	26·6	21·8	16·9	12·0	40
50	54·4	51·2	47·8	44·0	39·9	35·6	31·1	26·5	21·7	16·8	11·8	50
00	39 54·3	44 51·1	49 47·6	54 43·9	59 39·8	64 35·5	69 31·0	74 26·3	79 21·5	84 16·6	89 11·7	00
10	54·2	51·0	47·5	43·7	39·6	35·3	30·8	26·1	21·3	16·5	11·5	10
20	54·1	50·9	47·4	43·6	39·5	35·2	30·7	26·0	21·2	16·3	11·4	20
30	54·0	50·8	47·3	43·5	39·4	35·0	30·5	25·8	21·0	16·1	11·2	30
40	53·9	50·7	47·2	43·3	39·2	34·9	30·4	25·7	20·9	16·0	11·0	40
50	53·8	50·6	47·0	43·2	39·1	34·7	30·2	25·5	20·7	15·8	10·9	50

H.P.	L U	L U	L U	L U	L U	L U	L U	L U	L U	L U	L U	H.P.
′	′ ′	′ ′	′ ′	′ ′	′ ′	′ ′	′ ′	′ ′	′ ′	′ ′	′ ′	′
54·0	1·1 1·7	1·3 1·9	1·5 2·1	1·7 2·4	2·0 2·6	2·3 2·9	2·6 3·2	2·9 3·5	3·2 3·8	3·5 4·1	3·8 4·5	54·0
54·3	1·4 1·8	1·6 2·0	1·8 2·2	2·0 2·5	2·3 2·7	2·5 3·0	2·8 3·2	3·0 3·5	3·3 3·8	3·6 4·1	3·9 4·4	54·3
54·6	1·7 2·0	1·9 2·2	2·1 2·4	2·3 2·6	2·5 2·8	2·7 3·0	3·0 3·3	3·2 3·5	3·5 3·8	3·7 4·1	4·0 4·3	54·6
54·9	2·0 2·2	2·2 2·3	2·3 2·5	2·5 2·7	2·7 2·9	2·9 3·1	3·2 3·3	3·4 3·5	3·6 3·8	3·9 4·0	4·1 4·3	54·9
55·2	2·3 2·3	2·5 2·4	2·6 2·6	2·8 2·8	3·0 2·9	3·2 3·1	3·4 3·3	3·6 3·5	3·8 3·7	4·0 4·0	4·2 4·2	55·2
55·5	2·7 2·5	2·8 2·6	2·9 2·7	3·1 2·9	3·2 3·0	3·4 3·2	3·6 3·4	3·7 3·5	3·9 3·7	4·1 3·9	4·3 4·1	55·5
55·8	3·0 2·6	3·1 2·7	3·2 2·8	3·3 3·0	3·5 3·1	3·6 3·3	3·8 3·4	3·9 3·6	4·1 3·7	4·2 3·9	4·4 4·0	55·8
56·1	3·3 2·8	3·4 2·9	3·5 3·0	3·6 3·1	3·7 3·2	3·8 3·3	4·0 3·4	4·1 3·6	4·2 3·7	4·4 3·8	4·5 4·0	56·1
56·4	3·6 2·9	3·7 3·0	3·8 3·1	3·9 3·2	3·9 3·3	4·0 3·4	4·1 3·5	4·3 3·6	4·4 3·7	4·5 3·8	4·6 3·9	56·4
56·7	3·9 3·1	4·0 3·1	4·1 3·2	4·1 3·3	4·2 3·3	4·3 3·4	4·3 3·5	4·4 3·6	4·5 3·7	4·6 3·8	4·7 3·8	56·7
57·0	4·3 3·2	4·3 3·3	4·3 3·3	4·4 3·4	4·4 3·4	4·5 3·5	4·5 3·5	4·6 3·6	4·7 3·6	4·7 3·7	4·8 3·8	57·0
57·3	4·6 3·4	4·6 3·4	4·6 3·4	4·6 3·5	4·7 3·5	4·7 3·5	4·7 3·6	4·8 3·6	4·8 3·6	4·8 3·7	4·9 3·7	57·3
57·6	4·9 3·6	4·9 3·6	4·9 3·6	4·9 3·6	4·9 3·6	4·9 3·6	4·9 3·6	4·9 3·6	5·0 3·6	5·0 3·6	5·0 3·6	57·6
57·9	5·2 3·7	5·2 3·7	5·2 3·7	5·2 3·7	5·2 3·7	5·1 3·6	5·1 3·6	5·1 3·6	5·1 3·6	5·1 3·6	5·1 3·6	57·9
58·2	5·5 3·9	5·5 3·8	5·5 3·8	5·4 3·8	5·4 3·7	5·4 3·7	5·3 3·7	5·3 3·6	5·2 3·6	5·2 3·5	5·2 3·5	58·2
58·5	5·9 4·0	5·8 4·0	5·8 3·9	5·7 3·9	5·6 3·8	5·6 3·8	5·5 3·7	5·5 3·6	5·4 3·6	5·3 3·5	5·3 3·4	58·5
58·8	6·2 4·2	6·1 4·1	6·0 4·1	6·0 4·0	5·9 3·9	5·8 3·8	5·7 3·7	5·6 3·6	5·5 3·5	5·4 3·5	5·3 3·4	58·8
59·1	6·5 4·3	6·4 4·3	6·3 4·2	6·2 4·1	6·1 4·0	6·0 3·9	5·9 3·8	5·8 3·6	5·7 3·5	5·6 3·4	5·4 3·3	59·1
59·4	6·8 4·5	6·7 4·4	6·6 4·3	6·5 4·2	6·4 4·1	6·2 3·9	6·1 3·8	6·0 3·7	5·8 3·5	5·7 3·4	5·5 3·2	59·4
59·7	7·1 4·6	7·0 4·5	6·9 4·4	6·8 4·3	6·6 4·1	6·5 4·0	6·3 3·8	6·2 3·7	6·0 3·5	5·8 3·3	5·6 3·2	59·7
60·0	7·5 4·8	7·3 4·7	7·2 4·5	7·0 4·4	6·9 4·2	6·7 4·0	6·5 3·9	6·3 3·7	6·1 3·5	5·9 3·3	5·7 3·1	60·0
60·3	7·8 5·0	7·6 4·8	7·5 4·7	7·3 4·5	7·1 4·3	6·9 4·1	6·7 3·9	6·5 3·7	6·3 3·5	6·0 3·2	5·8 3·0	60·3
60·6	8·1 5·1	7·9 5·0	7·7 4·8	7·6 4·6	7·3 4·4	7·1 4·2	6·9 3·9	6·7 3·7	6·4 3·4	6·2 3·2	5·9 2·9	60·6
60·9	8·4 5·3	8·2 5·1	8·0 4·9	7·8 4·7	7·6 4·5	7·3 4·2	7·1 4·0	6·8 3·7	6·6 3·4	6·3 3·2	6·0 2·9	60·9
61·2	8·7 5·4	8·5 5·2	8·3 5·0	8·1 4·8	7·8 4·5	7·6 4·3	7·3 4·0	7·0 3·7	6·7 3·4	6·4 3·1	6·1 2·8	61·2
61·5	9·1 5·6	8·8 5·4	8·6 5·1	8·3 4·9	8·1 4·6	7·8 4·3	7·5 4·0	7·2 3·7	6·9 3·4	6·5 3·1	6·2 2·7	61·5

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